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JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[REGISTERED AS A NEWSPAPER.]

VOL. XXIII. No. 576.] LONDON, MAY 26, 1874. [26TH YEAR.] Price 6d.

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These Paints are now used in 100 Country Gas-Works, and by all (but one) of the London Gas Companies, on Gasholders, Scrubbers, Purifiers, &c. They will cover tar effectually. Also used by the Admiralty, War Office, Railway Companies, Founders, &c.
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PATENTEE & CONTRACTING GAS ENGINEER
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J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts and Fire-Bricks in the Kingdom. Orders for Fire-Clay Retorts of all shapes and dimensions, and to fit any shaped Mouthpiece, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.
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J. R. and Co. are the original manufacturers of Wrought-Iron Gas Tubes and Fittings, and Inventors of the LAP-WELDED TUBES for Locomotive and Marine Boilers.
J. R. and Co. make all kinds of Tubes and Fittings for Gas, Steam, and Water; Gun-Metal Cocks, Stocks, and Dies; Galvanized Tubes and High-Pressure Tubes, &c.
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Presented by Her Majesty's Government to the French Government;
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DRY GAS-METERS,
Warranted to Measure correctly, and not to vary.
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PURIFICATION OF ILLUMINATING GAS,

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Spence's Patent Dry Copperas,

The only Purifying Material which removes, by one process, all Ammonia and Sulphuretted Hydrogen. It has been in use for upwards of four years at some of the largest Gas-Works in the Kingdom.

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THE UNVARYING WATER-LINE GAS-METER,

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IMPROVED DRY GAS-METERS;

STATION-METERS OF ALL SIZES, with PLANED JOINTS;

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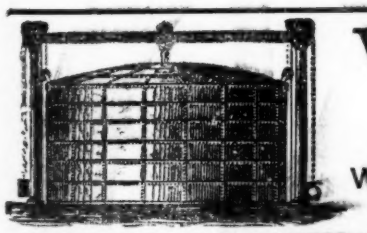
And all kinds of Experimental Gas Apparatus.



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STATION & CONSUMERS WET OR DRY METERS, STREET & SERVICE MAINS, LAMP COLUMNS & BRACKETS, & WROUGHT-IRON TUBES AND FITTINGS; WROUGHT-IRON ROOFS FOR ANY SIZE OF BUILDINGS.

Sole Makers of B. W. Thurston's Combined Condensing, Scrubbing, and Washing Apparatus,

AND PATENTEES OF THE IMPROVED COMBINED CONDENSING AND PURIFYING APPARATUS SO EMINENTLY ADAPTED FOR EXPORTATION.

REFERENCES TO UPWARDS OF 300 GAS-WORKS.

1862.

PATENT ANTIMONY PAINT.

CLASS II.

MADE ONLY BY

GEORGE HALLETT & CO.,

296, ROTHERHITHE, LONDON, S.E.

This Paint having been in general use over twelve years (especially in some of the principal Gas-Works), and proved itself the best light-coloured Paint produced for resisting the influence of vitiated atmospheres, it is important that its qualities should be more widely known.

It is not discoloured like white lead in a sulphuretted atmosphere, nor washed off like white zinc; and its light colour reflecting heat, produces much less expansion of gas in holders painted with it than with dark colours, besides rendering them much more sightly. Its specific gravity is so much below white lead that the same weight will cover one-third more surface, while it is equal in body; and its price being about the same (30s. per cwt.), it is actually one-third cheaper. From experience, its manufacture is greatly improved, and it is quite suitable for all purposes in which white lead is employed.

Reference is kindly permitted by the Engineers of the City of London, Commercial, London, and Surrey Consumers Gas Companies, who pronounce it the best Paint known for their purposes.

N.B.—Antimony Paint, COVERING SO MUCH MORE WORK, costs about 20s. per cwt., as compared with White Lead at 30s. per cwt.; a similar economy arises from its use in Steam and Gas Joints, for which purpose it is superior to White Lead.

SPECIAL DRIERS FOR ANTIMONY PAINT SUPPLIED.

GEORGE WALLER & CO.,

GAS ENGINEERS AND CONTRACTORS,

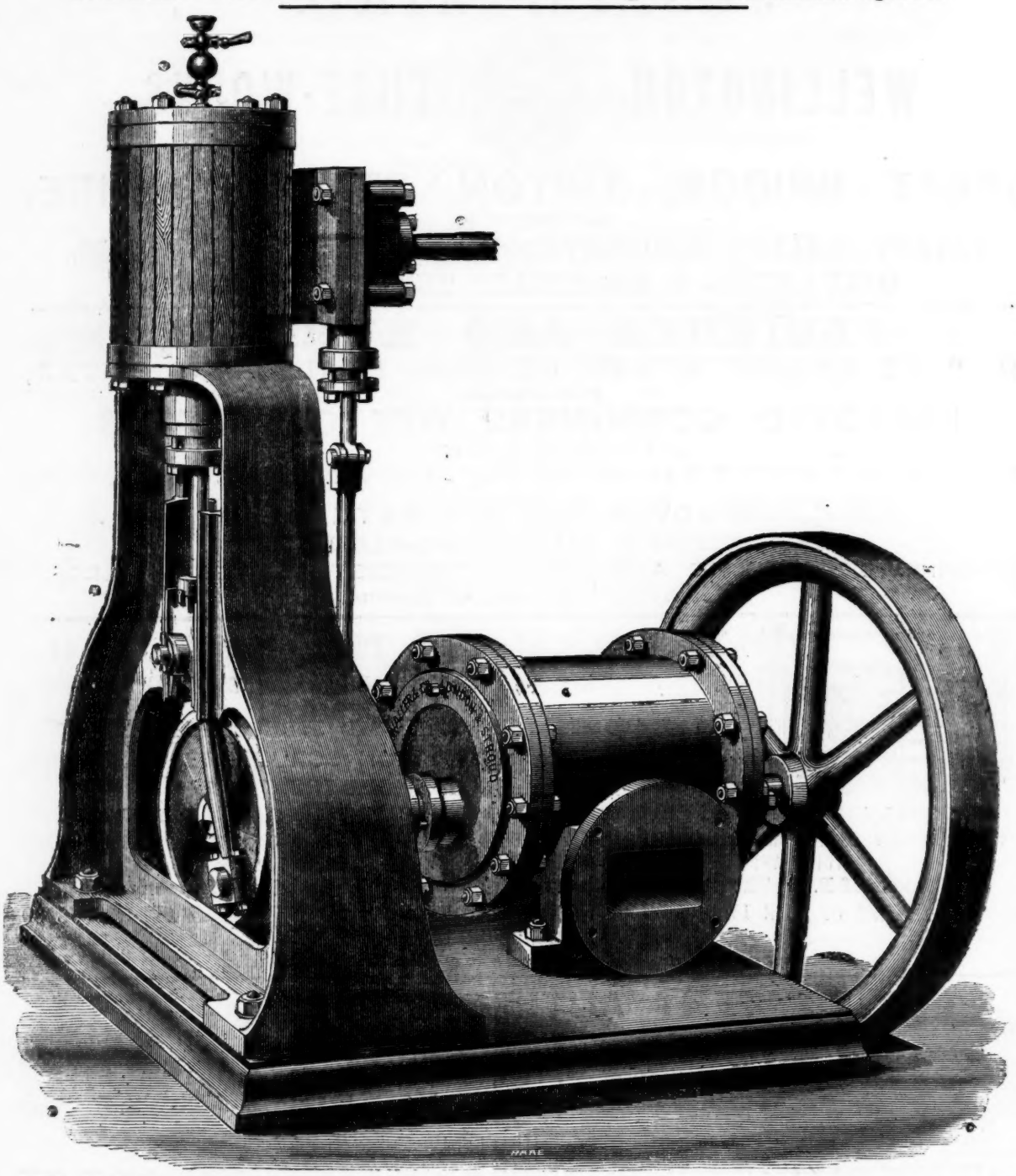
SOLE MAKERS OF

Beale's Improved

PATENT GAS-EXHAUSTERS AND COMBINED ENGINES,

ON ONE BASE PLATE.

NOTE.—The Exhausters are extra large for moderate speed.



This COMBINED VERTICAL ENGINE and EXHAUSTER was specially designed by G. WALLER AND Co. for small works, where space is an object, and is applicable for Exhausters from 1000 to 15,000 per hour. This is the *only* Engine and Exhauster **complete on one Base Plate,** requiring only one foundation.

NOTE.—They are sent away complete, and are easily fixed.

PHŒNIX ENGINEERING WORKS, HOLLAND STREET, SOUTHWARK, S.E.,

AND AT

STROUD, GLOUCESTERSHIRE.

WILLEY AND FORD,

GAS ENGINEERS,

WORKS: COMMERCIAL ROAD, EXETER,

INVITE THE ATTENTION OF GAS COMPANIES AND OTHERS FOR THE SUPPLY OF

EVERY DESCRIPTION OF GAS APPARATUS.

ENGINEERING DEPARTMENT.

NEW GAS-WORKS erected complete. Plans and Estimates furnished. MAINS, METERS, SERVICES, LAMPS, &c., adapted for Towns of any size. Gas Companies advised on Improvements, Extensions, and Alterations of Works.

GASHOLDERS AND TANKS.

RETORTS and RETORT-HOUSE FITTINGS, CONDENSERS, SCRUBBERS, ENGINES and EXHAUSTERS, PURIFIERS, STATION-METERS, GOVERNORS, VALVES, &c.

METER DEPARTMENT.

They beg special attention to the excellence and superiority of their WET and DRY METERS, several thousand being now in use by many of the largest Gas Companies in the West of England and South Wales. Warranted to measure correctly, and not to vary. Their acknowledged superiority has brought them into general use more rapidly than any Meters hitherto manufactured. A guarantee of Five years tendered with each Meter.

GAS-FITTING DEPARTMENT.

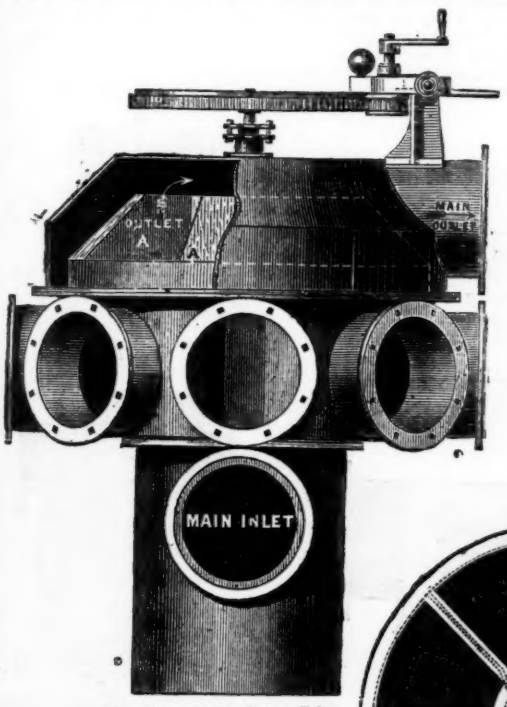
An extensive variety of Choice Designs in CHANDELIERS, PENDANTS, BRACKETS, STAR and SUN LIGHTS, MEDIÆVAL FITTINGS for CHURCHES, &c.

PATTERN-BOOKS and PRICE LISTS furnished.

☞ PLEASE NOTE THE ADDRESS—

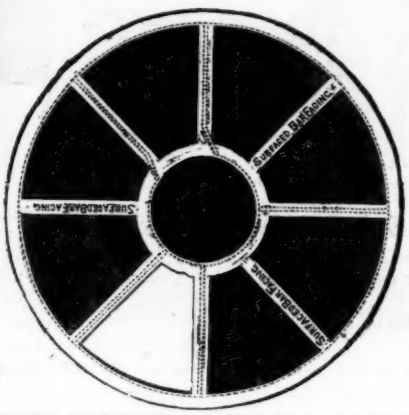
GAS ENGINEERING WORKS, COMMERCIAL ROAD, EXETER.

C. & W. WALKERS' DOUBLE-FACED GAS-VALVES.



Elevation of the Centre-Valve for four Purifiers. The safety cover is shown broken, to enable the Valve itself, which is inside, to be seen.

Plan of the Body, showing the Valve lying in it, with three of the facings, which were formerly exposed to settlements of dirt, carbon, naphthaline, &c., but which are now always covered by the surfaced bar-facings of the Valve. (See below.)



Plan of the Valve, or upper portion, showing the surfaced bar-facings referred to above.

These PATENT CENTRE-VALVES are the most perfect and certain means for working Purifiers. The Valve itself is protected from all injury inside the safety cover. The working of the Valve is so easy, and so governed by the stop-catch movement, that the Purifiers can be instantaneously changed in the dark as well as in daylight. They are scraped perfectly true, metal to metal, the facings heretofore exposed are always covered, and there is nothing more reliable, certain, and durable in a gas-works. By their use the floor of the Purifying-house is clear and level; the Valve and all connexions being beneath the floor, out of the way of working. A very considerable improvement and saving is effected in the cost of the connecting-pipes.

FOUR-WAY CENTRE-VALVES FORMING INLET, OUTLET, AND BYE-PASS.

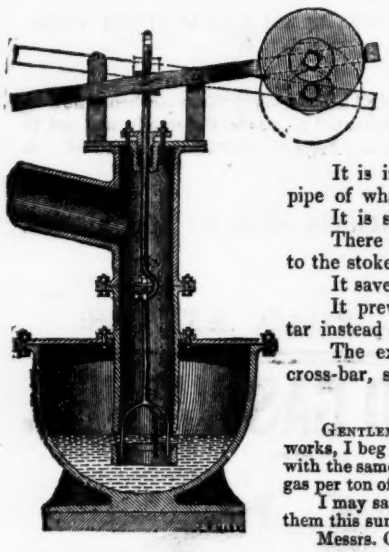
MIDLAND IRON-WORKS, DONNINGTON, near NEWPORT, SHROPSHIRE; 8, FINSBURY CIRCUS, LONDON.

CAFFALL, THOMAS, & CO., LIMITED.

PATENT IMPROVED SEAL

FOR

GAS HYDRAULIC MAINS.



It relieves the retorts from all pressure during the time gas is being made.

The end of the dip-pipe not being immersed in the tar, permits the gas to pass freely, and without pressure, from the retort into the hydraulic main.

The dip-pipe can be effectually sealed without trouble, to resist the back rush of gas, *to any possible pressure*, during the time of charging; but in the event of the Seal being left on, after the retort is closed, no inconvenience is caused, as the piece of pipe used as the Seal only lengthens it to an ordinary dip-pipe.

It is inexpensive, and can be easily and readily applied to any existing hydraulic main and dip-pipe of whatever shape or size, at a trifling cost.

It is simple in its arrangement, and cannot get out of order.

There is no deposit of carbon on the top of the retort, thereby saving considerable time and trouble to the stokers when drawing and charging, also the injury caused by scurfing the retort is avoided.

It saves 10 per cent. of the coal carbonized; also the same proportion of fuel, retorts, labour, &c.

It prevents the thickening of the tar in the hydraulic main, as the heated gas passes *over* the tar instead of being forced *through* it.

The extension piece of pipe is moved by a lever, from which hangs a ⅜-inch rod, hooked on the cross-bar, so that the lid of the retort cannot be struck without first sealing the pipe.

Alton Gas and Coke Company, Alton, Hants, April 25, 1874.

GENTLEMEN,—In reply to your inquiry respecting your Patent Dip for Hydraulic Gas-Mains in use at these works, I beg to say that, upon looking into our carbonizing account for the last 12 weeks, and comparing the result with the same quarters of the past five years, I find that your Dip has given our Company an increase of 1286 feet of gas per ton of coals beyond the make in the other years, notwithstanding the retorts have been in use for three years.

I may say that our Company are so satisfied with the Dips that it is intended to fit up the other retorts with them this summer.

I am, gentlemen, your obedient servant,

Messrs. Caffall, Thomas, and Co., Limited, 28, Gracechurch Street. WM. TRIMMING, Secretary.

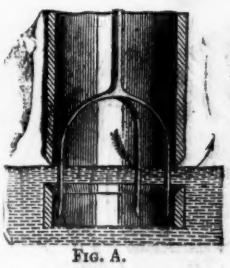


FIG. A.

Figure A shows the extension piece lowered to permit the gas to pass out of the dip-pipe without pressure.

Figure B shows the extension piece raised against the end of the dip-pipe, thereby preventing any back passage of the gas during the time of drawing and charging; and should it be left up while the gas is being made, no inconvenience is caused, *nor danger of bursting the retorts incurred; it being an open pipe and not a solid plug*, the gas will pass under as with the usual dip-pipe.

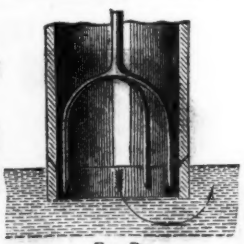


FIG. B.

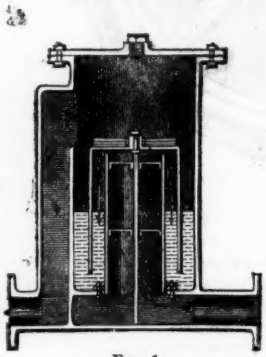


FIG. 1.

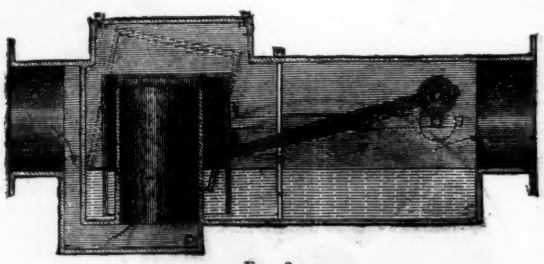


FIG 3.

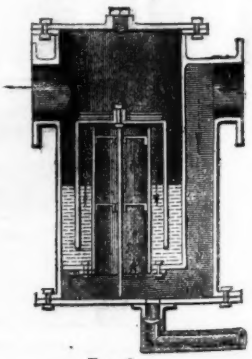


FIG 2.

BYE-PASS FOR EXHAUSTER (Fig. 1).

This Hydraulic Bye-Pass has been invented for the purpose of supplying to gas companies a cheap, effective, and self-acting valve. It is simple in its construction, cannot get out of order, perfect in its action, can be made to stand any pressure, occupies very little space, and can be adapted to any existing pipes.

Fig. 2 is a Valve similar to Fig. 1, but made to act as a self-acting hydraulic bye-pass for washers, condensers, scrubbers, and meters; the Valve part being *below* the inlet and outlet, so that it may be applied to underground mains. Both Valves can be fitted to existing mains without disturbing them, more than the cutting out of a sufficient length to permit the fitting in of the Valve; after being properly fitted, they will require no further attention.

SELF-ACTING HYDRAULIC SAFETY-VALVE (Fig. 3),

For preventing the back flow of gas from the gasholder, and thereby preventing the possibility of accidents (the great damage and danger to life and property resulting therefrom) through the breaking of pipes, unsealing of purifiers, or any other cause. It is easy and prompt in its action, for upon the forward pressure of the gas ceasing, the bonnet *instantly* closes over the stand-pipe, thereby effectually preventing any return of the gas; no extra pressure is put upon any part of the works by its use, and it can be made to tand any required pressure.

Every information can be obtained, and Models seen, at the Offices of the Company,

28, GRACECHURCH STREET, LONDON, E.C.

TANGYE BROTHERS AND HOLMAN,

LAURENCE POUNTNEY LANE, LONDON, E.C.,

SOLE MAKERS OF

MORTON'S PATENT SELF-SEALING RETORT-LIDS,

WITH

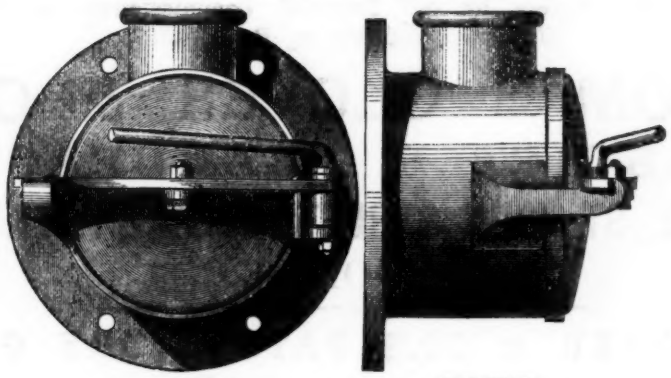
HOLMAN'S PATENT ECCENTRIC FASTENINGS.

OVER 10,000 IN USE.

NO LUTING.

LIDS HINGED TO MOUTHPIECES; NO LIFTING ON OR OFF.

NO SCREWS FOR FASTENING.



FRONT VIEW. SIDE VIEW.

SIMPLE.

ECONOMICAL.

DURABLE.

EFFECTIVE.

NO DUPLICATE LIDS REQUIRED.

These Lids are proved by many eminent Gas Engineers to be the most efficient, saving much time, labour, and expense; are opened and closed as quickly and with as little trouble as an ordinary furnace door, and by their use the Retorts are soundly sealed during the whole period of carbonization.

These Lids are Adopted by the following (among many other) Gas Companies:—

The Gaslight Company, Beckton (where over 2000 are in use).	The West Ham Gas Company.	The Salford Corporation Gas-Works.	The Carmarthen Gas-Works.
" Gaslight Company, Bow Common.	" Imperial Gaslight Company.	" Rochdale Corporation Gas-Works.	" Merthyr Tydfil Gas-Works.
" London Gaslight Company.	" Gas-Works, Arsenal, Woolwich.	" Liverpool United Gas-Works.	" Ystrad Gas-Works.
" Independent Gaslight Company.	" Commercial Gas Company.	" Birkenhead Gas-Works.	" St. Alban's Gas-Works.
" Phœnix Gaslight Company.	" Alliance and Dublin Gas-Works.	" Birmingham Gas-Works.	" Over Darwen Gas-Works.
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No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

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TUESDAY, MAY 26, 1874.

Circular to Gas Companies.

AGITATION, having for its object a reduction of the price of gas, we need not disguise, still continues in the metropolis. A meeting influentially attended was held at Kensington last week. Members of Parliament, representing almost every shade of political opinion, took part in the proceedings, and expressed a perfect unanimity on one point—gas companies must come down in their prices, or consumers must take the making of gas into their own hands. We need not pay much attention to the extra-parliamentary utterances of these gentlemen. They must do and say something for popularity sake; and just now the best game they can play is to attend a public meeting and abuse the gas companies. We may, however, be tolerably certain how even the majority of those present at the Kensington Vestry Hall would vote, if a confiscatory measure were to be introduced to the House of Commons.

Mr. Forsyth, for instance, who energetically defends the vested interests of publicans, could hardly go into the lobby in favour of the confiscation of gas companies. To be consistent, indeed, he ought to oppose the institution of competing undertakings, for the existing works are adequate to supply all the wants of the metropolis. A spirit licence is in these days a guaranteed monopoly in a district, and gas interests ought to be safe in a beer and spirit Parliament.

The proceedings at Kensington had rather a lame conclusion. The leading resolution carried was as follows:—That in the event of no steps being taken in Parliament to remedy the evils arising from existing gas Acts, it is essential the gas consumers adopt immediate measures for taking the manufacture and supply of gas into their own hands. Subsequently it was resolved to promote the formation of a great metropolitan organization, to promote a Bill in Parliament for the repeal or amendment of existing gas legislation.

Now, what is the grievance? The high price of gas. The cost of gas depends mainly on two things. In the first place, and notwithstanding Mr. Silverthorne, we say it is largely influenced by the cost of the raw material of distillation; and, next, by the necessity for earning maximum dividends. It is clear that Parliament cannot help us in the former matter. As regards the latter, a repeal, or the amendment, of existing gas legislation can only mean the reduction of maximum dividend. Of course, the word "necessity" we have used above will be objected to. But it must be remembered that gas shares have a price in the market on the faith of legislative guarantees. They are not speculated in like railway shares, on the strength of weekly traffic returns. They are invariably held as permanent investments, and are bought at a price which, as a rule, brings to the purchaser a little under 6 per cent. interest per annum. The amendment of existing gas legislation, which reduces statutory dividends, will consequently lower the value of shares; in other words, will confiscate a portion of the investor's property. This is the view of the question that will be put before Parliament, and the Kensington agitators—ultra Radical and Conservative—must decide whether or not it is desirable to commence a course of confiscation, of which gas proprietors will only be the first victims. To put greater restrictions on price would only have the same effect, and as we cannot see what Parliament can do but reduce price or dividend, we think we may rest assured that Parliament will do nothing at all. It will remain, then, for the consumers "to adopt "immediate measures for taking the manufacture and supply of gas "into their own hands." Well, we have before expressed an opinion, and will repeat it, that the gas consumers of the metropolis, represented by any responsible authority, may have the metropolitan gas undertakings if they will pay for them. We doubt whether any one of the companies would seriously oppose the purchase, if satisfactory terms and guarantees were proposed. But would consumers benefit by the transfer? We answer unhesitatingly, "No." The first effect, an equalization of price, might be to the advantage of the majority of present consumers, which is only saying that others would suffer. The idea that gas of the present quality will ever be universally supplied in this metropolis at an uniform price of 3s. per 1000 is, if a profit to go in aid of rates is to be made, a dream and delusion. We can imagine conditions under which it might be possible, but every contingency we speculate upon would involve a disaster. We are, of course, supposing that gas will continue to be made from coal. We may, perhaps, take too gloomy a view of the future, but we cannot help thinking that the circumstances which will make gas cheap will also render the consumer less able to pay the cost of it.

It has been stated, on good authority, that the Phœnix Company propose to reduce the price of gas to 4s. 2d. per 1000 after Midsummer. We fear that this concession will not satisfy the agitators in their district, and only hope that the reduction may be justified by the state of the company's balance-sheet at the end of the current half year. The announcement was made at a meeting of the Metropolitan Board of Works, at which a deputation from some South London parishes appeared to urge the Board to assist in obtaining a reduction in the price of gas. Their memorial has been referred to the Works Committee, and it is reported that at the next meeting a resolution will be submitted, pledging the Board to some course of action. We may in this way obtain a knowledge of the views the majority of the Board entertain on the question, and it is desirable to know them.

We are told that a bright idea has struck some of the South London malcontents. It is that the Metropolitan Board should buy up, not the whole undertakings, but only so much of the capitals of the several companies as would reduce all to a level. The capital of the South Metropolitan Company, for example, amounts to £4 10s. per ton of coal carbonized in 1872; that of the Phœnix Company to £7 7s. It is suggested that the Board should buy up the difference in the amounts, so that the companies might be put into a position to sell gas at the same price. There are some able financiers on the Metropolitan Board, and we should like to hear what they have to say to this proposal.

An allegation commonly made is that statutory gas companies have no motive for practising, and, consequently, do not practise, economy and good management in the conduct of their undertakings. They have the inducement which all tradespeople have to stand well with their customers, by supplying them with the best article at the lowest price; and, as regards practising economy, a host of gas managers might be found who would depose that they are driven to despair, and their lives made a burden to them, by the pinching and screwing of their directors. It may be that, at times, these latter close the spigot and open the bunghole; but

every one who knows anything of the management of gas undertakings will admit that the error is usually on the side of parsimony.

It might be premature to say that an entire change of feeling has come over the ratepayers of Tunbridge Wells in relation to the purchase of the gas company, but it may be safely asserted that the desire to get possession of the undertaking is not so strong as it was, even with those who most strongly advocated the acquisition. The success of the company's Bill in the House of Commons damped their ardour, and recent events have shown that companies against whom no accusation of malfeasance can be brought are as safe in the Upper as in the Lower House. The Local Board find themselves committed to heavy expenses, with no prospect of achieving their object, and the best thing they can do is to withdraw from the opposition as quickly, and at as small a cost, as possible. We allude to the matter, in order to remark on a letter from a correspondent in Leeds, which appears in a Tunbridge Wells paper. The writer mentions Leeds as an "awful example." He states that the price of gas has been raised by the Corporation 3d. per 1000, which is quite true, and not to be wondered at; that the quality of gas now supplied is much lower than that formerly furnished by the companies, which, we take it, is not altogether a correct statement; and he adds that the Corporation lost £6000 on the undertaking last year, which is not at all surprising. He goes further, and asserts that the price paid for the Leeds companies —£140 for every £100 of share capital—was exorbitant. Now, this is not true. The Leeds purchase was the cheapest ever made of important undertakings by a Corporation. It may be true that the works were not in first-rate order; if they had been, the price would have been much higher. The comparatively small town of Burnley, not far off, paid £300 for every £100 of capital, and do extremely well with the undertaking. Bradford paid £382 for every £100, and, though the Corporation cannot yet be congratulated on a great success, the promise of the future is fairly good. The Leeds Corporation, too, will, in time, do well, but, in our opinion, they would have done better without the gas undertaking.

We publish to-day a letter from Dr. Phelps, of Cambridge, who supplies an illustration of the fallacy of Mr. Silverthorne's theory, that an increase in the cost of coal is always compensated for by the enhanced value of residual products. If this theory were correct, the net cost of coal would be constant, and everybody knows that it is not. Mr. Silverthorne probably confined his attention to the metropolis, in which the conditions for the disposal of residuals might be supposed to be nearly equally favourable for all the companies. Running our eye, however, over the gas accounts for the year 1872, we see that (omitting the Chartered Company for special reasons) the cost of coal less residuals varied from 10s. 4¾d. in the case of the Commercial Company, to 6s. 4d. in the case of the South Metropolitan. Some of this difference may be readily accounted for on the supposition of long coal contracts; but much will remain, which is doubtless due to less profitable sales of residuals. In the country, gas companies are at greater disadvantages. With a very uncertain sale for coke, and low prices for tar and liquor, the net cost of coal is always much higher than in London. We need only add that we heartily wish, with Dr. Phelps, that provincial companies would adopt some joint action to obtain from Parliament the same measure of justice as has been awarded to some of the metropolitan companies.

Hills's Patent for Oxide of Iron Purification.—In the "History of Gas Lighting" (Journal, May 5, page 615) it was stated that in his application to the Privy Council for a prolongation of the term of his patent Mr. Hills "was opposed by several of the gas companies." It should have been added that Mr. F. J. Evans individually opposed his application, independently of the gas companies, at a cost of nearly £500, Mr. Evans contending that Mr. Hills was not in any way entitled to the patent, still less to its prolongation. In this he succeeded, and some part of his costs were paid out of the £1000 fine inflicted on Mr. Hills by the Privy Council.

Waste of Water at Glasgow.—At the monthly meeting of the Glasgow Water Committee, on the 18th inst., a motion was submitted by Mr. Scott, to the effect "that the engineer be instructed to take observations by meter in various districts of the city and suburbs, in such numbers as will afford in his judgment a fair general indication of the average domestic use and waste of water per head; and also to give the needful relative statistics for showing the price paid per head per 100,000 gallons for the water so used and wasted at rental rates, and to report." In supporting his motion, Mr. Scott said the consumption of water per day in Glasgow was 54 gallons per head, while in similar cities the quantity was only 25 gallons. Mr. Gale, the engineer, had told him that as soon as the consumption increased 1½ million gallons upon the present quantity he would require to ask the committee to arrange for an extra supply. With what was unaccounted for and the 6¾ millions wasted, they had 12¼ million gallons of water passing through their pipes per day, which, at the estimated cost of 20s. per 100,000 gallons, entailed an annual expense on the city of £44,700. Mr. Young seconded the motion. In answer to the Provost, Mr. Gale said he thought an investigation into the waste of water would be advantageous. With the exception of Greenock, the water supply of Glasgow was higher than that of any town in Scotland. If the requirements of the city were to exceed 34 million gallons, it would be requisite to lay the large syphon pipe for the loch. The motion was adopted, and remitted to the sub-committee on works.

WATER AND SANITARY NOTES.

The Shoreditch Vestry have had before them a report of their medical officer of health, and another from their Sanitary Committee, the latter recommending that a notification be made to the Metropolitan Board of Works, that it is desirable that a constant supply of water should be given to houses within the parish, and, as the companies are willing to furnish it, the Board be requested to make the necessary requirement. The medical officer urges the imperative necessity for a constant supply, because of the dirty state of the receptacles for water, especially in the houses of the poorer classes, who, he argues, are driven to beer and spirit drinking in consequence of the filthy state of the water. He further asserts his belief that the health of the inhabitants is prejudicially affected, and in many cases endangered by the present intermittent supply, and calls attention to the fact that both the New River and East London Companies have expressed a desire to make the Act of 1871 work beneficially for the public. It is hardly necessary to say that the vestry rejected the proposal of the Sanitary Committee by a large majority. If, they argued, butts and cisterns are dirty, whose fault is it but that of the people themselves? Let them suffer for their laziness. And then comes the argument that always tells in a vestry: think of the cost the proposed change would impose on the owners of small properties. So Shoreditch will not have a constant supply of water, and never will until vestries are swept away, as they must be before many years are over. The leading opponents to the introduction of this, according to the doctor, life-saving system of sanitary reform, were Mr. Cain and Mr. Death.

Bolton is not exactly short of water, but the Town Council are alarmed at the prospect, and urge a necessity for the utmost economy in the use of water. The supply of the Corporation has been augmented by an act of great generosity on the part of the managers of the Entwistle reservoir, who give gratuitously a million of gallons a day for the use of the borough. Even with this addition, the supply is likely to be short, if we do not have more rain. It is with no pleasure that we find fault with Corporations, but we may just remark that, if such water as that by all accounts recently distributed in Bolton, had been sent out by a company, the protests of the Town Council would have been loud and furious.

Hull, as our readers were informed last week, has been short of water in consequence of an accident, the possible occurrence of which ought, however, to have been foreseen and provided for. It will be remembered that a similar accident, a few years ago, proved fatal to the existence of the Brighton Water Company. The supply in Hull has been greatly restricted, to the extreme inconvenience of the inhabitants; but it is only fair to say that the Corporation have done their best to remedy the matter as quickly as possible, and it may be that by this time everything has been set to rights.

The Local Board of Bromley (Kent) are anxious to drain the neighbourhood and have a sewage farm, and want a Provisional Order, under the Lands Clauses Consolidation Act, 1845, to enable them to make a compulsory purchase of land on which to construct a tank and a pumping-station. They are opposed mainly on the ground that the scheme, if carried out, would involve very unequal rating to the neighbourhoods concerned, the outlying districts being heavily taxed for the benefit of New Bromley. Objection is also made that a sewage farm would be a nuisance to the neighbourhood, and it was admitted by Dr. Carpenter (of Croydon) that a nuisance might be created at the pumping-station if not properly managed. The inquiry is adjourned till the 4th of June, and we may not now make further reference to the matter.

We mean nothing invidious when we say that among the medical officers of health appointed for rural districts, under the Sanitary Act, few can compare in point of knowledge and ability with Dr. Child, the officer for Oxfordshire. He has just published a report on the results of his twelvemonth's work in a district comprising an area of 700 square miles. We may say at once that we do not agree with him on every point, and think a longer experience will alter some of his views. It is not easy to say anything new as to the means of conserving and disposing of nightsoil, but here is something which, if not altogether novel, is worthy of attention:—

The system, says Dr. Child, which appears to me best suited for all villages and towns in which there are no regular water-works, is one which up to the present time has found no favour in England. It is the system of water-tight cesspools, carefully ventilated, and emptied by means of atmospheric pressure, as is at present in use in the city of Milan. This system has the great advantage over the dry methods, that it provides for the liquid refuse, and at the same time it avoids all the worst difficulties which beset the system of complete water sewerage, which I may speak of, for shortness sake, as the London system. . . . Unfortunately it appears to be scarcely known to English sanitarians. It is disposed of by Professor Corfield in a single sentence, and in the elaborate report of the Birmingham committee it is not even mentioned. The fact is that a clumsy imitation of it exists in Paris, and offends the noses of the Englishmen who go there—many more in number than those who go to Milan—and hence the system itself has never received the attention which it des-

serves. In Milan it is represented to have been a complete success, and it has recently been adopted, with some slight alterations, which appear to be questionable improvements, in Florence.

If landlords could be persuaded to make the water-tight cesspools, the sanitary authority might provide the atmospheric apparatus and could certainly make a profit on the removal of the manure. As regards the water supply of villages, Dr. Child's experience fully confirms the statements of Mr. B. Denton, which will be found in another column. It is the exception, he says, speaking only of Oxfordshire, to find in country districts a supply at once wholesome, plentiful, and easily accessible to the people. The rule is scarcity, and water in the foulest condition. In fact, Dr. Child is of opinion that, as a general rule, the water supplied by the London companies, about which so many complaints have been made, is incomparably better than that which our rural population is compelled to use, and he justly remarks that, before any excuse can be found for legislative interference with London water companies, Government ought to take some measures to enable the country population to get water at least not worse than the worst of that which is supplied to London. Cottage accommodation appears to be neither better nor worse in Oxfordshire than elsewhere in England, and Dr. Child writes rather strongly on the matter. The question is a very difficult one to deal with, and sanitary authorities can at present do little more than remonstrate and advise.

If further shocking examples of villages scarce of water, and otherwise in bad sanitary condition, are wanted, they may be found in Flintshire, and reported on by Mr. Jones, the medical officer. One of these, Penbrigog, is delightfully situated; but it has a natural defect in its deficiency of water supply. The nature of the soil is clayey, and there is only one well for the whole neighbourhood, and that is often dry, and, moreover, is conveniently placed to receive the drainage from some 100 houses, which, as a rule, have no privy accommodation, and no back doors. When the well is dry, the inhabitants have a quarter of an hour's walk for all the water they want. The condition of the children, as observed by the medical officer, seems to show that they do with as little as possible.

We need not, however, go to Wales for examples of villages scarce of water. One summer, not many years ago, we saw the inhabitants of a village in Surrey, place guards over a small brook which trickled between them and another village, and daily encounters took place for the little dribble of water.

As we surmised, the promoters of the Edinburgh and District Water Bill have made an arrangement with the Mid-Lothian Water Company by which the latter surrender their scheme for £10,000. It is said that not a penny of the capital of the Mid-Lothian Company has been raised, nor a sod of earth turned to make the works authorized last year. The parliamentary expenses of the promoters of the scheme must, however, have been heavy, and they will not get rich on the bargain made, nor will they have raised themselves in the esteem of their fellow-countrymen.

Birmingham has been respited. Vice-Chancellor Bacon has extended the time for the execution of a part of the sewerage works until February next, and as regards another portion of the works until next May. There is also a chance, after a a suggestion of the Vice-Chancellor, that some arrangement may be come to between the Corporation and Sir Charles Adderley, which will prevent a recurrence of this wearisome and ruinous litigation. We wish Sir Charles had gone to the Local Government Board. He would then have had his special attention directed to the difficulties towns experience in disposing of their sewage, and extended knowledge might have led him to be less litigious and exacting. A tall chimney within sight of the eye, and a sewage-tank within reach of the nose, are, no doubt, nuisances from an aristocratic point of view; but ordinary mortals have to put up with these things every day, and receive no compensation.

The grand sewage works designed by Sir John Hawkshaw for Brighton are now completed, and will be brought into use in a few days. They will convey the sewage out to sea at Portobello, some three miles east of Brighton, and it is confidently expected that no nuisance will be occasioned on the shore, either at Brighton or at the growing neighbourhood near the outlet. If any complaint arise, it will probably be from Rottingdean, which is not likely to be benefited by the vicinity of the outlet.

A Bill to amend the late Lord Derby's Alkali Act, 1863, has been brought into the House of Commons by the Government. Its provisions are based on the experience gained in the working of the Act under the able direction of Dr. Angus Smith. A definite mode of estimating the amount of muriatic acid sent into the atmosphere by an alkali work is now proposed, by enacting that a cubic foot of air escaping from a chimney-shaft shall not contain more than one-fifth of a grain of the acid. Some other "noxious gases" are now to be brought under the notice of the inspectors, and the provisions of the Bill will require further notice at our hands.

In addition to the already recognized means at the command of municipalities for the making of money and the saving of rates, another has recently been brought under the notice of the House of Commons. Sir R. Anstruther proposes to introduce the Gottenburg system into Scotland. This, most of our readers will know, consists in the buying up of the public-houses by the municipality, it being argued that no private person ought to derive a profit from the sale of beer and spirits. The plan has succeeded in Gottenburg, and, as a consequence, it is said poor-rates have been abolished. Surely, with a monopoly of the supply of water, of gas, and of liquors, a rate of any kind ought to be unknown in a borough. But why stop at the trades mentioned? Why not supply other "necessaries of life"—bread and meat—and distribute a bonus among the population?

A TREATISE ON THE SCIENCE AND PRACTICE OF THE MANUFACTURE AND DISTRIBUTION OF COAL GAS.

XV.

The Various Kinds of Coal.

The chemical changes briefly described, the final result of which has been the conversion of woody fibre into anthracite, have, no doubt, taken place under varying conditions of heat and pressure, and thus we have coals differing in their physical, as well as their chemical characters. A classification of coals has been proposed, based partly on their physical appearances and their age, and partly on their chemical composition. The broad division, sufficient for our purpose, is made into *lignite, or brown coal*, the most recent formation; and then varying chemically as well as physically, we have *caking coal, cherry coal, splint coal, cannel* or *parrot coal*, and *glance coal* or *anthracite*. The distinctive characters, however, are not always well marked, the groups blending one into the other, so that at times no line of demarcation can be drawn.

Lignite, or Brown Coal.—Coal of this class is found at Bovey Tracey, in Devonshire, in a small field near Lancaster, and in the neighbourhood of Lough Neagh, in Ireland. Lignite possesses but small interest to the gas maker. It is ordinarily found saturated with moisture, which it retains with great tenacity, and when distilled it consequently gives off a large quantity of water, more or less charged with acetic acid, with but little gas of low illuminating power, and of a very unpleasant odour, and only a small quantity of tar. The coke left behind is almost valueless as fuel.

In appearance the lignites vary considerably. The Bovey Tracey coal has a distinctly ligneous structure, and rarely presents a conchoidal fracture. In colour, lignites vary from a greyish to a brownish black, most often without lustre. They burn readily, giving a bright flame, and leaving a white ash. A variety of lignite, which nearly approaches the bituminous caking coals in composition, has been denominated pitch coal. This is of a deeper colour, and often presents a conchoidal fracture, and is of much more value to the gas maker.

The next group of coals are of much more importance to the gas producer.

Caking Coal.—This variety is met in almost all the coal-fields of Great Britain, but is chiefly found in the Newcastle and Wigan districts. It derives its name from the fact that, when heated, it first of all breaks up into small fragments, which subsequently undergo a kind of fusion, and become agglomerated into a compact mass. In highly bituminous samples the fusion takes place at once, a pasty mass being formed from which volumes of gaseous matter are seen to escape. When burnt in the open air, as in an ordinary grate, the fire requires frequent stirring in order to break up the cake, so as to admit of the access of air necessary for its complete combustion. It is, however, a favourite household coal, and deserves its reputation, since it gives out more heat than most other kinds of coal. Caking coal is rather friable, it has an uneven fracture, and a lustrous greyish-black colour. It is easily ignited, and burns with a yellowish, lively flame.

The coke produced in retorts from these coals is rather soft, but otherwise of excellent quality, and, taken altogether, they offer the best material the gas manufacturer can operate upon.

Cherry, or Soft Coal.—This kind of coal greatly resembles that above described, but it differs in not undergoing fusion when heated. It is very brittle, and the fractured surfaces present an iridescent appearance; hence it has sometimes been called Peacock coal. It is easily lighted, and burns out very rapidly.

Splint, or Hard Coal.—This variety of coal has a black or brownish black colour, with a resinous lustre. It is hard and less frangible than caking coal, and its fracture when broken is uneven and splintery. Hence its name. The chief use for it is in metal making, and it is the kind of coal most commonly employed in smelting operations, its hardness enabling it to support, without breaking down, the superincumbent mass of ore. It is ignited with more difficulty than the varieties previously described; but, once kindled, it produces a clear fire and gives out a great heat. Farther than this, splint coal yields the best oven coke for locomotive purposes. This coke is excessively hard, and bears transport well, and hence it is largely employed.

Cannel Coal.—The name of this coal is obviously a corruption of the word candle, it having formerly been used by the poor in Lancashire for the same purpose as candles. In Scotland it is sometimes called parrot coal, from the chattering noise it keeps up when burning. This

variety of coal has a hard, compact, even texture, so much so that it has been cut into a variety of useful and ornamental articles, such as plates, inkstands, snuff-boxes, beads, &c. The surface presents a shining resinous lustre, the colour varying from jet to a brownish black. The fracture is conchoidal in every direction in most samples, but in some of the best kinds, as Boghead coal, it is sometimes slaty. The chief deposits of cannel coal are found in Scotland, near Glasgow, at Lesmahago, and in the Wigan district. There are, however, others in North Wales and Warwickshire, and recently some has been raised in Ireland, at Coal Island, Ulster.

It was once disputed whether Boghead cannel was or was not a true coal, and the same question might be raised with regard to all other cannels. At a trial, in which all the most eminent geologists, chemists, and microscopists in Great Britain were engaged, it was affirmed on the one side that Boghead cannel was a bituminous shale, which presented no trace of organic structure or vegetable origin; while, on the other side, it was asserted that traces of vegetable structure were everywhere apparent—fossil plants, especially stigmaria of various kinds, being found in every part of the coal. In the end, a matter-of-fact jury decided that the Boghead mineral was a true coal, and the question has never since been raised.

Anthracite, or Glance Coal.—This kind of coal, possessing no practical interest to the gas manufacturer, may be dismissed with a very brief description. True anthracite is a dense, hard, compact substance, with a peculiarly bright lustre, which is sometimes iridescent. It is perfectly free from bituminous matter, but "semi-anthracites" are found in which bituminous coal occurs, sometimes in interstratifications, and in some cases distributed through the whole mass to such an extent as to make the classification difficult. True anthracite is ignited with difficulty, and burns without emitting flame. It does not form coke, the fracture remaining the same after the coal has been heated in an oven or retort.

In concluding our remarks on the physical characters of coal, we may here condense some observations of Mr. Patterson, which have an especial value for gas makers. They are contained in a paper published in the "Transactionsof the British Association of Gas Managers" for 1872. Coals, says Mr. Patterson, present certain indications, more or less defined, which justify at least the presumption whether the coal is suitable for gas-making or otherwise. The first of these is *cubical structure*. It occurs stratified, massive, columnar, and in ovidal concretions. The two former classes contain the source from whence the chief, if not the sole, supply of our gas coals is derived. These are generally divided into parallel layers of various thickness by what are called "partings." Vertical to these parallel lines are a succession of flaws or cracks, cutting through the stratum in the direction of its bearing or level. These divisional lines produce a tendency to break it down into parallelopidal masses, which in some cases present clean bright surfaces, while in others the lustre is covered with a white sparry concretion [sulphate of lime] the presence of which is not objectionable in a coal used for the manufacture of gas. These characters are uniformly found, to a greater or less extent, in soft and easily frangible coal, and may be taken as reliable indications of a good coking and generally of a good gas coal. The lustre of a coal also offers reliable evidence of its coking quality, but less definite in relation to its gas-producing properties. All our best gas coals possess a degree of lustre more or less bright; but there are coals with a bright lustre altogether unsuited for gas manufacture, and experience alone can identify this difference—a difference which may be said to rest upon "a shade."

The fracture and cross-fracture, Mr. Patterson continues, offer the distinguishing marks of a good gas coal. When gently broken, they will show the fractures to be either cubical, conchoidal or semi-conchoidal, or intermediate angular, presenting a fine black pitch-like or resinoidal surface. Another well-marked and highly-important character is the streak or shade of colour indicated upon the surface. When scratched with the point of a nail or blunt steel point, the eroded surface will present either a dull brown, brown inclining to black, black inclining to brown, dull black, bright black, or lustrous. It will invariably be found that coal possessing either of the two former characters yields gas of rich quality, and the more the streak approaches to a brown colour the greater will be the yield of hydrocarbon under distillation. "From a long experience," Mr. Patterson adds, "I have found this to be the most positively reliable of all the external evidences we possess in approximating the value of gas coal or cannel."

The Chemical Composition of Coal.—Our knowledge of the chemistry of coal is at the present moment almost entirely confined to a knowledge of its ultimate composition. We know it to be made up of variable proportions of carbon, hydrogen, oxygen, and nitrogen; but there are reasons for believing that in bituminous coals there exist ready-formed definite compounds, at all events, of hydrogen and carbon. This subject is under investigation by able hands, and cannot now be further alluded to. Besides these strictly organic ingredients, coals contain varying amounts of what must be regarded as impurities in the shape of mineral matters, which constitute the ash, and pyrites or bisulphide of iron. The appearance of concretions of the latter substance has obtained for them the name of "brasses," a familiar word in gas-works. Sulphur in the free state is sometimes present in coal, and arsenic is occasionally found in combination with the pyrites. It is speculated that a volatile organic compound containing sulphur is found in some coals, but the proof of this is not at present clear.

The chemical formulæ for coal previously given represents the composition of what chemists call a molecule of the substance, and will convey to the reader only a vague, and, probably, an erroneous idea. Coal has no definite composition. The proportion of its constituents sometimes varies considerably even in different parts of the same seam. In pure anthracite carbon forms more than 90 per cent. of the substance, while in Boghead this element constitutes only 63 per cent. of the mass. Between these two extremes there are an infinite number of variations, some of which are illustrated in the analyses of Dr. Lyon Playfair, and others, here appended:—*

Mean Average Composition (per Centage) of some Newcastle Coals.

Name of Coal.	Specific Grav.	Carbon	Hydrogen.	Nitrogen.	Sulphur.	Oxygen.	Ash.	Per Cent. of Coke.
Willington	..	86·81	4·96	1·05	0·88	5·22	1·08	72·19
Tanfield	1·26	85·58	5·31	1·26	1·32	4·39	2·14	65·13
Bowden Close	..	84·92	4·53	0·96	0·65	6·66	2·28	69·69
Haswell Wallsend	1·28	83·47	6·68	1·42	0·06	8·17	0·20	62·70
Newcastle Hartley	1·29	81·81	5·50	1·28	1·69	2·58	7·14	64·61
Hedley's Hartley	1·31	80·26	5·28	1·16	1·78	2·40	9·12	72·31
Bates's West Hartley	1·25	80·61	5·26	1·52	1·85	6·51	4·25	..
West Hartley main	1·26	81·85	5·29	1·69	1·13	7·53	2·51	59·20
Original Hartley	1·25	81·18	5·56	0·72	1·44	8·03	3·07	58·22
Average of 18 samples from different mines	1·256	82·12	5·31	1·35	1·24	5·69	3·77	60·67

Mean Average Composition of Lancashire Coals.

Ince Hall Company's Arley	1·27	82·61	5·86	1·76	0·80	7·44	1·53	64·0
Haydock, Rushey Park	1·323	77·65	5·53	0·50	1·73	10·91	3·68	59·4
Blackbrook, Little Delf	1·26	82·70	5·55	1·48	1·07	4·89	4·31	58·48
Wigan four feet	1·20	78·86	5·29	0·86	1·19	9·57	4·23	60·00
Wigan cannel	1·23	79·23	6·08	1·18	1·43	7·24	4·84	60·33
Caldwell and Thompson's higher delf	1·274	75·40	4·83	1·41	2·43	19·98	5·95	54·2
Average of 28 samples from different mines	1·273	77·90	5·32	1·30	1·44	9·53	4·88	60·22

Derbyshire Coals.

Earl Fitzwilliam's Elsecar	1·296	81·93	4·85	1·27	0·91	8·58	2·46	61·6
Holyland and Co.'s Elsecar	1·317	80·05	4·93	1·24	1·06	8·99	3·73	62·5
Butterlay Company's Langley	1·264	77·97	5·58	0·80	1·14	9·86	4·65	54·9
Staveley	1·27	79·85	4·84	1·23	0·72	10·96	2·40	57·86
Average of seven samples from different mines	1·292	79·68	4·94	1·41	1·01	10·28	2·65	59·32

Welsh Coals.

Aberaman, Merthyr	1·30	90·94	4·28	1·21	1·18	0·94	1·45	85·0
Aberdare Co., Merthyr	1·31	88·28	4·24	1·66	0·91	1·65	3·26	85·83
Anthracite (Jones and Co.)	1·375	91·44	3·46	0·21	0·79	2·58	1·52	92·9
Coleshill	1·29	73·84	5·14	1·47	2·34	8·29	8·92	56·0
Rock Vawr	1·29	77·98	4·39	0·57	0·96	8·55	7·55	62·50
*Rhos Lantwit, Caerphilly	1·282	76·995	5·455	0·700	1·643	12·875	2·332	63·308
*Do. do.	1·302	73·41	5·507	0·35	2·414	14·276	4·043	65·327
*Tyr Flikens Colly., Newport	1·368	82·117	5·054	0·595	2·537	5·794	3·903	64·867

* We are indebted to Mr. Fiddes, of Bristol, for these analyses, and also for those which immediately follow.

Forest of Dean Coals.

Coleford High Delf Seam	1·219	78·81	5·303	1·750	2·062	9·056	3·020	63·97
*Do. do.	1·315	76·502	5·380	1·090	1·669	8·659	6·700	62·60
Lydney Trenchard Seam	1·354	80·709	5·425	0·735	1·271	7·060	4·8	63·38
Pillowell Coals, near Lydney	1·354	74·464	5·292	0·511	2·667	6·831	10·235	60·360

Scotch Coals.

Boghead	1·218	63·936	8·858	0·962	0·320	4·702	21·222	31·7
Wallsend Elgin	1·20	76·09	5·22	1·41	1·53	5·05	10·70	58·45
Grangemouth	1·29	79·85	5·28	1·35	1·42	8·58	3·52	56·6
Eglinton	1·25	80·08	6·50	1·55	1·38	8·05	2·44	54·94

The above analyses will suffice to give the reader a general idea of the per centage composition of coal. The gas-producing power of coal will be treated of in another article.

Correspondence.

REPAIRING SMALL HOLES IN GASHOLDERS.

SIR,—In the report of the proceedings of the "West of Scotland Gas Managers Association," as given in your JOURNAL of April 7, I notice a very excellent paper by Mr. John Hall, of Newmilns, "On a Simple Method of Repairing Small Holes in Gasholders." Having had, for the last five years, more experience in this line than I care for, I will tell you the plan I have adopted, which, for simplicity and efficiency, I think is all that can be desired—at least, I have found it so on various occasions where it was sharp work or no gas. One of these occasions occurred some three years ago, during a storm in the night, when three of the guide pulleys on the upper section of a telescope holder broke, allowing the holder to change position, so that the pulleys were just off the friction-plates. The holder was on the city at the time. When I reached the works (after being notified of the accident) there was a rent 3 feet long and wide enough (by one edge being pressed in) to put in your hand with ease. This was caused by the holder pressing on the edge of the pulleys. I stopped the ripping by breaking off the pulley, and, having but one holder, slacked off the retort-lids, so that the hole was soon under water and the leek stopped.

I now took means to ascertain the length of the rent (which I found to be about 4 feet), cut a patch the proper size, and punched it the same as ordinary gasholder sheets. One side of this patch I covered with cement prepared by mixing red lead, lithrage, Paris white, and boiled oil. As daylight was appearing, the benches were charged; and, as the holder raised, I put on the patch, holding it firmly to its place with a lever. Reaching down under the water with a sharp pointed punch, I punched a hole in the holder through one in the patch, tapped it with a ¼-inch taper tap (thread 32 to an inch), and, inserting a round-

* It is a matter of regret that we have not a greater number of analyses of the gas coals now found in the market. Our readers will know that these coals are usually only assayed for the production, and their ultimate composition is neglected. Before this work is completed, we hope, by the kindness of friends, to supply some deficiencies under this head.

headed machine screw, screwed the patch tight to the holder, and, as it raised, I kept on punching, tapping, and inserting screws, and in less than three hours the damage was repaired, with no loss of gas or annoyance from it blowing in your face while working, except what little might escape while you were tapping and putting in the screw. Previous to this accident, and since, I have repaired many small holes in this way. The only part of the work that needs care is the punching of the holes. See that the punch is sharp, and of such form as will throw a good deep burr on the inside, and that the tap has plenty of taper, and you will never miss a hole.

If you think, sir, that this "backwoods" plan of mending holders might be of any service to the West of Scotland, "or any other men," please give it a corner in your JOURNAL, and I hope they will accept it as a small acknowledgment for the many good things we receive from them through your valuable JOURNAL. I hope some day to be permitted to attend some of these pleasant and instructive gatherings in person.

Milwaukie, Wis., U.S.A., May 6, 1874. JAS. H. WALKER.

IMPROVEMENT IN STREET LANTERNS.

SIR,—Mr. J. H. Walker, in a letter to you on street lanterns, says, "I never could see the use of glass in the top of a lantern, it being the earth and not the heavens we want lighted." This is true in one sense, but *are* the heavens lighted? Is any portion of the rays of light, thrown up from the burner, lost? I answer—"No." In streets of houses the rays are thrown upon the houses, and reflected back into the road, and from lamp to lamp, to the benefit of equestrians as well as pedestrians. Tin-top lanterns and reflectors are all very well to light a doorway or dangerous passage, but for public lighting they are a step back to the days of oil lighting and semi-darkness. I have not forgotten the sight (over 30 years ago) the first night the British Gas Company lighted up a road with glass-top lanterns, which we had exchanged for old tin-top ones. Instead of a concentrated light under the foot of the lantern, we had the rays of light thrown in all directions. The change was so great that every one was pleased with the improvement, and, from that time, tin-top lanterns soon became abolished. Now they are almost forgotten, I suppose we may expect them to be introduced as *something new*.

Lower Sydenham, May 19, 1874. MAGNUS OHREN.

THE COST OF COAL AND THE VALUE OF COKE.

SIR,—I have just read the remarks in your truly able and valuable JOURNAL, on Mr. Silverthorne's pamphlet. Will you allow me to supply one definite example in refutation of Mr. Silverthorne's doctrine, that the cost of raw material is not the most important item in the cost of gas, for the reason alleged by Mr. Silverthorne—viz., that "the increased price in coal is always compensated for by a corresponding rise in the price of residual products."

Here, in Cambridge, as I presume was the case everywhere else, when coal first began to attain its extraordinary price, we did not at once assume that the rise was other than an occasional irregularity. We, consequently, did not think it right to raise the price of coke, which, as cheap fuel, is a great blessing to the poor, and especially in the district immediately bordering on the gas-works. When, however, the advanced price of coal assumed a more obstinate character, we raised the price of coke in proportion, and, for some months, we maintained the rise with a moderate degree of success. Nevertheless, our stock of coke kept every day increasing; and thus, when the price of coal began to fall, we found ourselves with a very large stock of coke made from coal of the highest price, but which we were obliged at once to offer at a considerable reduction. Indeed, at this very time, we have in our yard an unusual accumulation of coke of excellent quality, which is being but slowly disposed of at 9s. per chaldron, although made mostly from coal of nearly the highest price. And this state of things has come on, in spite of every consideration, of a commercial character, which could be given to the subject by my colleagues in the direction, who are first-rate men of business.

If, as Mr. Silverthorne's statement would imply, all the coke and other residuals made from high-priced coal could be disposed of at a proportionally high rate, I grant that the cost of raw material would not be so important an element—though still very important—in the cost of gas. But I deny that any such correspondent prices can commercially be maintained with a fluctuating coal market.

I do hope that some joint action will be taken by provincial gas companies throughout the country to obtain from Parliament at least the same measure of justice as has been awarded to the companies of the metropolis.

ROBERT PHELPS,
Chairman of the Cambridge University and Town Gaslight Company.

PANAMA GAS COMPANY, LIMITED.—A notice has been issued calling an extraordinary general meeting of this company for the 4th proximo, to consider, and, if approved, to pass resolutions purporting that the company is unable to pay its debts, and ought to be wound up, and that it be wound up voluntarily, and to appoint liquidators.

IMPROVEMENTS AND NEW PROCESSES IN THE MANUFACTURE OF GAS.—The most important feature in the invention of M. G. Hirzel is that of making hydrogen gas heated to redness, in a retort also heated to redness, act on the vapours and gases obtained from tarry products and certain oils. By such means hydrocarbons are produced, which burn with a brilliant light, together with some matters which without that would not be changed into a lighting gas, but would only produce particles of coke, pitch, and tarry oil. The invention consists also in the construction of an apparatus called an "Augmentator," in combination with other apparatus for utilizing gas-producing oils. In increasing the quantity of gas, M. Hirzel obtains a full development of the principles above described, which can hardly be improved on. Following these conditions, M. Hirzel not only fills the pipe with coke and iron, but also the retort, according to the nature of the materials employed, not following an invariable rule in this respect, but one adapted to the variety of oils, &c., used. The invention consists further in the arrangement of the "Augmentator," in that he does not use the pipe by the side of the retort only, but above, below, and inside of it. In the latter case, he introduces the pipe through the cover of the retort, whether this be filled or not. The pipe passes through three-quarters of the length of the retort, the hydrogen being introduced at the end of it, and thus it immediately acts on the oils it is about to decompose.—*Journal de l'Eclairage au Gaz.*

Parliamentary Intelligence.

HOUSE OF LORDS.

MONDAY, MAY, 18, 1874.

The LORD CHANCELLOR acquainted the House that the further Standing Orders applicable to the Lymm Water Bill have been complied with, and that no further Standing Orders are applicable to the Tunbridge Wells Gas Bill.

The Llanelly Gas, and Broadstairs Water (No. 2) Bills were read a third time, and passed.

GAS AND WATER ORDERS CONFIRMATION BILL.—Order for the House to go into committee, on Tuesday, May 19, discharged. A petition praying to be heard against the Bill (Sidmouth Gas Order) was presented from trustees of the will of G. E. Balfour, deceased.

Petitions against the Tunbridge Wells Gas Bill were presented from (1) Local Board of Health of Tunbridge Wells, (2) John Heugh.

TUESDAY, MAY 19.

The LORD CHANCELLOR acquainted the House that the further Standing Orders applicable to the Grantham Gas Bill have been complied with; and that no further Standing Orders are applicable to the Aberdare and Aberaman Gas, Hythe Improvement and Water, and Peterborough Gas Bills.

The Shipley Local Board of Health Bill was reported specially from the Select Committee, with amendments.

The Fylde Water, Horbury Local Board, and Ulverston Local Board Bills were brought from the Commons, read a first time, and referred to the Examiners.

THURSDAY, MAY 21.

The Lymm Water, and Tunbridge Wells Gas Bills were read a second time, and committed.

FRIDAY, MAY 22.

The Airdrie and Coatbridge Water Bill was reported, without amendment.

The Shipley Local Board of Health Bill was read the third time, and passed.

The Belfast Corporation Gas, Chester Water, and Wakefield Water Bills were brought from the Commons, read a first time, and referred to the Examiners.

GAS AND WATER ORDERS CONFIRMATION BILL.—Order of Friday, May 15, committing the Bill to a committee of the whole House discharged; and Bill committed to a Select Committee.

HOUSE OF COMMONS.

MONDAY, MAY 18, 1874.

The Fylde Water, Horbury Local Board, and Ulverston Local Board Bills, were read the third time, and passed.

The Belfast Corporation Gas, Chester Water, and Wakefield Water Bills, as amended, were considered; to be read the third time.

Report, that no Standing Orders not previously inquired into are applicable in the case of the Nottingham Water Bill (Lords), laid upon the table; Bill to be read a second time.

MUNICIPAL CORPORATIONS (BOROUGH FUNDS) ACT, 1872.—A petition for alteration was presented from Kingston-upon-Hull.

METROPOLITAN GAS COMPANIES ACCOUNTS.

Sir C. DILKE asked the President of the Board of Trade when the annual accounts of the Metropolitan Gas Companies would be presented.

Sir C. ADDERLEY: All the accounts have been received at the Board of Trade with one exception. As soon as that one is received, the accounts will be laid before Parliament.

SEWAGE MANURE.

Mr. HICK asked the President of the Local Government Board whether he had any information in his office showing the quantities and varieties of manure which had been made from sewage in this country through Municipal Corporations or Sanitary Boards, and the average prices each kind of manure had commanded in the market.

Mr. SCLATER-BOOTH: There is no information at the Local Government Board upon that subject.

GAS ORDERS CONFIRMATION BILL (Lords) considered in Committee, and reported, without amendment; to be read the third time on Tuesday, May 19.

TUESDAY, MAY 19.

The Belfast Water Bill was reported.

Reports, that no Standing Orders not previously inquired into are applicable to the Middlesborough Extension and Improvement, and Ystrad Gas and Water Bills (Lords), laid upon the table. Bills to be read a second time.

MUNICIPAL CORPORATIONS (BOROUGH FUNDS) ACT, 1872.—Petitions for alteration were presented from Bolton and Walsall.

GAS ORDERS CONFIRMATION BILL (Lords) read the third time, and passed.

A requisition to withdraw their petition against the Edinburgh and District Water Bill was lodged by Robert Craig and Sons.

The Padiham Water Bill was referred to a select committee, consisting of Colonel Loyd Lindsay (chairman), Colonel Stuart, Mr. Stacpoole, and Sir Colman Rashleigh, to meet on Thursday, June 4, at twelve o'clock.

WEDNESDAY, MAY 20.

The Enniskillen Gas, and Fairfield Local Board Bills (Lords) were read a second time, and committed.

The Broadstairs Water (No. 2) Bill (Lords) was read a first time, and referred to the Examiners of Petitions for Private Bills.

MUNICIPAL CORPORATIONS (BOROUGH FUNDS) ACT, 1872.—A petition for alteration was presented from Margate.

The Dublin Corporation Water Bill was reported.

THURSDAY, MAY 21.

The Belfast Corporation Gas, Chester Water, and Wakefield Water Bills were read the third time, and passed.

The Cupar Water Bill was reported.

MUNICIPAL CORPORATIONS (BOROUGH FUNDS) ACT, 1872. — Petitions against alteration were presented from Liverpool (two), and for alteration from Derby and Romsey.

EPPING WATER AND DRAINAGE WORKS.

Dr. LUSH asked the President of the Local Government Board what amount of money has been expended on the water and drainage works of the Epping Special Draining District, and what arrangements have been made, or are intended to be made, in respect to its repayment? Whether the president is aware of the fact that more than two-thirds of the houses in the said district are entirely devoid of a water supply and drainage, and that the mortality in the district last year was not less than 30 per thousand? And whether any steps are being taken towards the completion of the works; and, if not, whether it is the intention of the Local Government Board to cause the Rural Sanitary Authority of Epping to do its duty in the matter?

Mr. SCLATER-BOOTH said: The sum spent on the Epping water and drainage works amounts to about £11,500. I am aware that the drainage and water supply of the district are defective, and that the rate of mortality is very high. With regard to the question what steps are proposed to be taken with

a view to the completion of the works and to secure the repayment of the money, I received only yesterday a deputation from Epping, and would prefer to defer giving an answer till after Whitsuntide.

A Petition against the Nottingham Water Bill was presented from the Corporation of Nottingham.

FRIDAY, MAY 22.

METROPOLIS WATER SUPPLY AND FIRE PREVENTION BILL.—Second reading deferred till Friday, June 12.

The Wigan Improvement, and Edinburgh and District Water Bills were reported.

The Skipton Local Board of Health Bill, as amended, was considered; to be read the third time.

The Llanelly Gas, and Shipley Local Board of Health Bills (Lords) were read a first time; and referred to the Examiners of Petitions for Private Bills.

HOUSE OF COMMONS.

TUESDAY, MAY 12.

(Before Mr. KNIGHT, *Chairman; Mr.* FRESHFIELD, *Mr.* DAVIES, *and Mr.* WILSON.)

DUNDEE WATER BILL.

Mr. DENISON, Q.C., Mr. CLERK, Q.C., and Mr. SHIRESS WILL appeared for the promoters (the Dundee Water Commissioners); Mr. J. T. ANDERSON appeared for the petitioner (Miss Laird, of Strathmartine).

Mr. CLERK, in opening the case, said the object of the bill was to enable the Dundee Water commissioners to execute a deviation in the authorized conduits or lines of pipes from Lintrathen, to construct a new reservoir, and for other purposes. One of those purposes was an increased power of borrowing money, as the amount sanctioned by the Act which the commissioners obtained in 1871 was found insufficient, owing to the recent advance in wages and the price of iron. Up to 1869 the supply of water to Dundee was in the hands of a private company, who from time to time carried out works for increasing the supply, but in that year the works were transferred to a body of commissioners, who were also the local authority of the burgh. Dundee was very peculiarly situated. It rose from the banks of the Tay, in fact almost from the sea level, to a height of 500 feet at the upper part of the town. There was, therefore, considerable difficulty in conveying water to the people living at all these various levels. In the lower level there was a population of about 96,000, in the middle level 14,000, and in the upper level there were at present 32,000 inhabitants, whose number was rapidly increasing. Though the existing pipes were sufficient for the supply of the lower and middle levels, they were inadequate to meet the wants of the people in the upper district, and accordingly the commissioners, when they got their Act in 1869, set about ascertaining where they could procure an additional supply. Mr. Bateman, in 1871, proposed a scheme to bring water from Lintrathen by a circuitous route to Crombie Den, but it would have been brought to a level inconvenient for the supply of the higher parts of Dundee. The consequence was that instructions were given to Mr. Leslie, civil engineer in Edinburgh, to prepare plans to bring in water by a more direct course and to a higher level. Mr. Bateman had proposed to construct a small reservoir on the Law, and Mr. Leslie also proposed to make a similar reservoir on the Law at a higher level. Mr. Leslie only got notice to prepare his plans in November, 1871, and all that he had time to do was to prepare plans for the direct ronte, *viâ* Newtyle, on a higher level, and the proposal to make a mall reservoir on the Law. At the time Mr. Leslie made his plans he saw it would be necessary, sooner or later, to have a distributing reservoir in connexion with the main pipes. On the 6th of December, 1871, Mr Leslie had reported that it might be necessary to have a distributing reservoir on the Lintrathen line of pipes, and that a very good site could be found at Auchterhouse. The plans having been necessarily prepared on short notice, there was no plan before Parliament in 1872 for the construction of a reservoir of that sort, and Mr. Bateman pointed out that it was an objection to the parliamentary plans in that they did not provide a distributing reservoir on the line of pipes. There was no doubt that the small reservoir which Mr. Leslie proposed to construct on the Law would not give half a day's supply, supposing there was a severe drought. There was a considerable pressure on the pipes from Lintrathen, and in the event of a fracture in the pipes the whole population of the upper part of Dundee, amounting to 32,000, would be left without water. A distributing reservoir was also necessary to allow the water from Lintrathen Loch, which might be occasionally turbid, to settle. In the spring of 1873 the Messrs. Leslie drew up a report on the question, and it was on certain words in that report that the principal part of the opposition rested. In that report they stated that, although a distributing reservoir on the line of pipes was not absolutely necessary for the town of Dundee, it would be attended with material advantages, and that it would be advisable in laying the pipes to make provision for its future construction. The most suitable site for the reservoir, they added, was not at Auchterhouse—as had been proposed—but at Clatto Muir, on the property of Miss Laird, of Strathmartine. The ground was agricultural land, and, having been frequently in the market for sale, they had little doubt that arrangements could be made with that lady. Unfortunately, that anticipation had not been fulfilled, and Miss Laird appeared as an opponent of the scheme before the committee. Her petition alleged that the estate being in the vicinity of Dundee was valuable for feuing purposes; but Clatto was not a very attractive spot, for the feus on the estate were let at from £8 to £10 an acre, while land at an equal distance from Dundee was feued at from £20 to £40 an acre. The principal objection of the petition was founded on the paragraph in the report that it was not absolutely necessary to construct the reservoir immediately. But it was only after Messrs. Leslie had published their report that it was discovered that 32,000 of the inhabitants of Dundee would be deprived of water in the event of a fracture in the Lintrathen service of pipes. Although it was not absolutely necessary to construct a reservoir to the extent now asked, still it was desirable to provide for a rapid increase in the population of Dundee. In the hasty survey of 1871 Messrs. Leslie had thought that Auchterhouse would be a suitable site for a reservoir; but, on further inquiry, they found that a much better place could be selected at Clatto Muir, which was only half the distance of Auchterhouse from Dundee. That alteration in the line of pipes necessitated the deviations now under consideration, and the only question was whether the petitioner should part with her land for that purpose. In constructing a reservoir of this kind it would be absolutely necessary to have a different set of pipes for the purposes of distribution in Dundee, and it was a serious question to the consumers and to the public whether those pipes should be continued for six miles or only for three miles. Unless some injury was done to Miss Laird, the proprietrix of the Strathmartine estate, the committee would no doubt say that the commissioners were well advised in thus diminishing the cost of water to the consumer. As to the allegation that the reservoir would be injurious to the estate by the statement that all the tenants had assented to the proposed erection of the reservoir, the estate of Strathmartine had been in the market for the last four years and had not met with a purchaser, and that very year it had been exposed for sale. The land could not, therefore, be of a very attractive character, as alleged in the petition. The petitioner also spoke about her rights being injuriously affected by the bill; but the members of the committee knew well that if the commissioners took a part they were bound to take the whole of the land, and give full compensation. The petition contained a drawing of the reservoir in the form of a square parallelogram, but there could be no objection to making it circular, and enclosing it with a plantation, and thus give it rather an ornamental character. The Monikie reservoir had been so enclosed, and it was now one of the prettiest spots in the neighbourhood. The petition referred to the beauty of the estate, but there were several mills in the neighbourhood, and a bone-crushing establishment rejoicing in the name of Rose Mount. It was not, therefore, necessary to dwell further on that. The proposed reservoir, from its ornamental character, would rather enhance than injure the value of the property. It was intended to make it an ornamental work, surrounded with trees, and in every respect an attractive place of resort for the townspeople. The commissioners had shown every disposition to deal fairly with Miss Laird. They did not anticipate any opposition on her part, considering the comparatively useless nature of her land at present, and they were sorry she should have put herself in opposition to a project which was considered by competent judges essential for the wants of a large and growing population.

Mr. *William Robertson*, examined by Mr. CLERK.

I am an engineer and ironfounder in Dundee, and a member of the Police, Water, and Harbour Boards. I have had considerable engineering experience. The reservoirs at Monikie are situated at a height of 425 feet. In 1869 the higher parts of the town were temporarily supplied, but it was found necessary to have an increased supply. In 1870 I was appointed convener of a committee to inquire into the subject, and the result was that Mr. Bateman was instructed to prepare plans for the Lintrathen scheme. By the Act of 1871 it was proposed to store the waters of the Melgum and Inzean in an impounding reservoir. The water comes from a drainage area of 19,000 acres, capable of yielding 27 million gallons a day, besides giving compensation. It is situated at a height of 650 feet above the Ordnance level, or 225 feet higher than Monikie. After giving evidence relating to the unopposed parts of the bill, Mr. Robertson continued—By the Act of 1872, a pipe-track was authorized, *viâ* Newtyle to Dundee, and part of the plan was to have a small reservoir on the Law, 70 feet higher than that proposed by Mr. Bateman. In the spring of last year I reported to the commissioners that it was impossible under Mr. Leslie's distributing scheme to supply the higher districts. On careful inquiry we found that the town had been rapidly extending in the higher districts, and that it was indispensable to give them a good supply. Within the last two years as many as 10,000 people have gone to the upper district, and in consequence of the street improvements now being carried out by the town, a great many more persons will migrate to that district. For these reasons we found it absolutely necessary to have a distributing and a settling reservoir when the waters of Lintrathen should become turbid. It will also provide a remedy in the event of a fracture to the pipes across the Strathmore Valley. There is a descent of about 550 feet, and that enormous pressure is continued for miles. In the event of an accident to those pipes, the 32,000 people who occupy the higher level would be totally without water, as the supply from Monikie would be required for the lower districts. It being absolutely necessary to have a distributing reservoir, we had several discussions with Messrs. Leslie and Stewart on the subject. There was a considerable difference of opinion between Mr. Leslie and Mr. Stewart. It is essential for the welfare of Dundee that this distributing reservoir should be made, and the commissioners are unanimously in favour of it. The Clatto Muir is in a very exposed situation. It is arable land now, but of a very poor character. The reservoir to be constructed would be surrounded by plantations, and would not necessarily be in the form sketched in Miss Laird's petition. If in a bleak district like this there was an ornamental piece of water, it would increase the value of the property. We made every effort to settle the case without coming here, but we have been met with obstruction.

Cross-examined by Mr. ANDERSON: There have been no public meetings to approve of the scheme. At the ward meetings no questions were asked about this scheme, as there was a perfect unanimity of opinion in relation to it. A considerable quantity of the pipe has been laid down up to the point where the deviation takes place. There would still be a risk of the pipes bursting in the 16 miles between Lintrathen and Dundee, but it is to meet the inconvenience arising from such an event that we propose to construct the new reservoir. The question of pressure was first brought under our notice by our water manager. The commission did not adopt the report, but remitted to myself, as convener of the Works Committee, along with the manager, to go more thoroughly into the whole question. The report which was presented is the document now before the committee. We have a constant supply; and no cisterns in the houses.

The CHAIRMAN: In consequence of the constant supply and the difference of level, it is necessary for the commissioners to have two supplies—one for the high and one for the low district; otherwise the one district would draw off all the water?

Witness: Yes.

The CHAIRMAN: That is one of the blessings of constant supply.

Re-examined by Mr. CLERK: We are prepared to make the reservoir an ornamental work. It does not follow that it is to be formed simply of the four walls shown in the plans.

Mr. *Brownlee*, examined by Mr. CLERK.

I am a builder in Dundee. I have myself building land on the higher levels of the Law. The land is rapidly becoming occupied with houses, and the population is increasing very fast. The population on the eastern slope of the Law has increased about 10,000 in the last two years. There are four-storeyed houses in this part of the town, and this is the part of Dundee where that class of houses is likely to increase. It is a very central position for the working classes.

Cross-examined by Mr. ANDERSON: I estimate the increase of population from general knowledge, and not from accurate information.

Mr. *Alexander Leslie*, examined by Mr. CLERK.

I have been engaged in business as an engineer for 12 years, and have been for three years in partnership with my father, Mr. James Leslie. I have had great experience in carrying out water-works. I have been joint engineer with my father in this Lintrathen scheme. I prepared the plans for the bill of 1872, but we had very short notice to prepare them. At that time Mr. Bateman's plan had been sanctioned, and our plan was to lay out a direct track at a higher level. I believe that there would be great advantage in having a service reservoir at Clatto or Auchterhouse. They are both on the same gradient, but there would be considerable economy in having the reservoir at Clatto, which is nearer Dundee. The yield from Monikie is 4 million gallons per day; but with the storeage reservoirs we can go on at the rate of 38 gallons per head per day. That was before the new distribution, and, owing to the alteration of the piping, it cannot be delivered in the high district. We at one time thought that 5 million gallons a day from Lintrathen would be sufficient; but the commissioners desired, owing to the increase of population, that it should be 8 millions. This rendered necessary the construction of a large storeage reservoir. I think that Clatto Muir is a good place for constructing this reservoir. It is sufficiently far from Dundee to avoid the risk of contamination. The depth of the reservoir will be 28 feet at the deepest part. This would give 10 days supply at 8 million gallons per day, so that there would be sufficient time to repair any fracture which might occur in the piping. I apprehend no danger from the reservoir. These reservoirs are sometimes made very ornamental. At Monikie, Lord Panmure has compelled the reservoir to be made in an ornamental style. The water would not be stagnant.

Cross-examined by Mr. ANDERSON: The Law reservoir could not be made to supply the higher districts. It would be very costly, and would affect the

distribution of the water generally. It was not planned with reference to the objects which we now have in view at all. It was intended to supply about 1000 people. The 8 million supply is provided with respect to the prospective wants of the town, but the necessity for it will always go on increasing. There are new manufactories constantly being put up. The cost of the reservoir and pipes would be £63,000. I prefer the Clatto site because it is more convenient. It was in consequence of the rearrangement of the system of distribution that it was found necessary to apply for the Clatto reservoir.

Mr. ANDERSON: Would it not be possible to make a reservoir nearer to Dundee?

Witness: Clatto is the only suitable site that I am acquainted with.

Re-examined by Mr. CLERK: A reservoir in the neighbourhood of Dundee would require to be covered over, and the cost of roofing such a large reservoir would be very great. An enlargement of the proposed reservoir on the Dundee Law would not meet the new distribution scheme of the commissioners.

By the CHAIRMAN: There is no Act of Parliament compelling us to cover in a reservoir, nor are we compelled to filter the water. There is no arrangement for filtering the water at Lintrathen. I am not aware that under the intermittent supply in London the consumption of water is 25 gallons per head per day.

Mr. *James Leslie*, who was engineer to the Dundee Water Company from its commencement, gave corroborative evidence. If he had known in 1871 that, in the event of the Lintrathen supply being accidentally cut off, some 32,000 people would be deprived of a supply of water, he would not have made the report as to a distributing reservoir being unnecessary. There was no difference of opinion, he thought, between Mr. Stewart and himself as to the deviation of the pipes, but only as to the time when it should be done. Dundee had increased in population very rapidly. When he first designed the Dundee Water-Works it was for a population of 70,000, and now it was necessary to provide for 140,000. It was for that reason that the commissioners wished the available daily supply increased from 5 to 8 million gallons. The water in the reservoir would not be stagnant; but, so far as that was concerned, there was a quarry half full of water on the property. The land in Strathmartine was not likely to be feued except for manufacturing purposes.

Cross-examined: He was not consulted about the redistribution of the piping. It was physically impossible to supply 12,000 people above the Monikie level, and the new reservoir would be necessary to supply them, not taking into account the redistribution of piping. He thought that for years to come 5 million gallons a day would be sufficient for Dundee; but the commissioners were of opinion that there should be 8 million gallons.

Re-examined: The Commissioners of Dundee were in a better position to form an estimate of the wants of Dundee than he was.

WEDNESDAY, MAY 13.

Mr. *T. Hawksley*, examined by Mr. CLERK.

I am a civil engineer, and have been engaged in most large water undertakings in this country. I have been long familiar with the water circumstances of Dundee. On several occasions lately I have considered the question now before the committee, and have had my attention particularly turned to the subject of a service reservoir near the town—a reservoir which will be needed for more purposes than one—for equalizing the supply to the various districts of the town, and for ensuring safety. The present scheme is one which I think well devised for the purposes to which it is intended. In order to give an equal supply to all the districts of the town, it will be necessary that a larger quantity of water should be stored than was contemplated. I should, however, explain that it was foreseen that such storeage would be necessary. Large quantities of water will be required for manufacturing purposes in proportion to the quantity required for domestic use. One firm alone employs 3000-horse power, and the flax trade is enormously developing. As to the site where the reservoir should be constructed, I think that the site of the reservoir now selected is very much superior to the site originally chosen at Auchterhouse. It is much nearer the town, and better suited for equal distribution, because you can more easily lay such an additional number of pipes to it as may be found necessary. The site of the now proposed reservoir is better than the site chosen at Auchterhouse because, whereas the Auchterhouse reservoir was on the slope of a hill, this one is in a natural hollow. The reservoir, as proposed, will hold a supply for 10 days, so that if at any time the Lintrathen water became muddy, the supply here stored would give a sufficient supply till it became clear. It would also enable repairs to be made of any breakages of pipes, and, as in the first year or so pipes are always breaking, the reservoir is, in my opinion, an immediate necessity.

Cross-examined by Mr. ANDERSON: Mr. Leslie has been engineer to the Water Commissioners, and I have been called in to give my advice. Better work than some of Mr. Leslie's I have seldom seen. The existing state of distribution in Dundee in regard to the three different levels is such that some places cannot be supplied at all. The supply is just now solely from Monikie. Stobbsmuir is not a large reservoir. It is, in fact, a tank in a house, but cannot compare at all with a reservoir proper. There is a small reservoir at Clepington. It may or may not be the intention to shut that reservoir up; but if it be shut up it will not much matter, for it does not contain a tenth of a million of the supply.

Re-examined by Mr. CLERK: It would be wholly impossible to make the Stobbsmuir reservoir supply the higher level district of the town.

By the CHAIRMAN: It is not desirable to supply the lower levels of the town from the high pressure new reservoir. It will be better to supply the lower levels from Monikie, but probably with water carried into Monikie from Lintrathen. Of course by Monikie I mean that the supply should come from the reservoir at Stobbsmuir. There will be more water required in the low levels than can be supplied by Monikie.

Mr. *James Watson*, examined by Mr. SHIRESS WILL.

I am the manager and engineer of the water-works belonging to the Dundee Commissioners. The supply of water constantly requires to be increased. Within the district to be supplied, which includes Broughty Ferry, there is a population of at least 150,000, continually growing. The town is peculiarly situated because of the rapid rise of the levels in its various districts. Most of the spinners and power-loom works are situated on the lower levels, and the Stobbsmuir reservoir, which holds five and three-quarter millions, is sufficient to supply these. The second or middle level district comprises Lochee, which is supplied from the Lawton reservoir, and so much of the high level district is supplied from Clepington. Part of the high level district cannot be supplied at all. In the high level districts many new streets are being constructed, and it is absolutely necessary something should be done to give the district an adequate water supply. There have been constant complaints of an unequal supply of water, caused by taking water off the mains to supply the upper portions of the town. The proposed reservoir will remove the cause of these complaints, because it will give an equal supply. I agree in the evidence given by Mr. Hawksley as to the capacities of the reservoirs.

Cross-examined by Mr. ANDERSON: We have never been able fully to supply any portion of Dundee from the Monikie stores. The upper portion of the town has hardly been supplied at all. There are three storeage reservoirs for Monikie, which would supply for 120 days at the present rate of consumption. By means of a double set of pipes to Gagie Well we could not double the supply of water. We might add about 3½ millions. I do not know what the cost of laying a double set of pipes would be. I have not made the calculation. In the meantime we are laying in the lower district of the town a large number of additional pipes for the distribution of the water. When the Lintrathen water is got we shall as far as possible supply that to the upper district, whence the water is at present often shut off six or eight hours, so that the lower district of the town may be properly supplied. Even if we had pipes large enough to carry the full supply of Monikie water to Dundee we could not supply the higher levels. Moreover, the supply is by no means certain. In 1870 we were threatened with a cessation of the supply because of the drought. We have complaints every day of the short supply of water.

Re-examined by Mr. S. WILL: It would be very difficult to construct a new stone aqueduct from Gagie Well. The Lintrathen water is a great deal purer than Monikie water, and therefore it is desirable to make arrangements for supplying the whole of the town.

By the CHAIRMAN: The present stone aqueducts might be made to carry 7 million gallons with safety. If the supply was on the intermittent system this additional expense might be saved.

The CHAIRMAN: Am I to understand that, while the supply to the lower levels is cut off in order to give pressure to the upper districts, the inhabitants of that district will be deprived of water?

Witness: Yes, for six or eight hours.

The CHAIRMAN: That is one of the blessings of constant supply.

Mr. *Gale*, examined by Mr. CLERK.

I am a civil engineer in Glasgow, and have constructed water-works for the supply of several towns in Scotland. I had charge of the Loch Katrine water-works. The service reservoir contains 19 days supply at the rate of 40 gallons per head per day. The reservoir is about six miles from Glasgow. Our stone aqueduct is 25 miles long, and we have never had any interruption in that part of the service. But we have 3¾ miles of cast-iron piping across three valleys, and the supply of water to Glasgow is constantly being interrupted by the bursting of the pipes. I know the situation of Dundee and the length of iron piping from Lintrathen to Dundee. I look upon the Strathmore valley as a very formidable objection to bringing water from Lintrathen to Dundee. The valley is very deep, and I do not know of any cast-iron piping of that length under such pressure. I do not think anything similar has ever been tried before. It is a very curious experiment, and engineers will watch with interest the result of subjecting cast-iron pipes of such great length to that extraordinary pressure. For this reason there is great necessity for the Clatto reservoir. I think the reservoir on the Law would be of no use. We had four similar reservoirs in Glasgow, but they were of no utility. The supply of water in Greenock is 90 gallons per head; Paisley, 36; Aberdeen, 35; and Edinburgh, 40 gallons per head, when they can get it.

Cross-examined by Mr. ANDERSON: The larger a pipe is, the greater liability to burst. The valley of Strathmore must be crossed with the piping. With reference to the present supply of water for Dundee, a reservoir of the proposed size is necessary in case of a bursting in the pipe.

Re-examined by Mr. CLERK: The Clatto reservoir would also allow the water to settle when the Lintrathen water was turbid.

By the CHAIRMAN: There is great waste of water in Greenock, and also in Glasgow.

Mr. *Thomas Buchan* was the next witness. He said, I am a land valuator in Dundee, and have had a large experience. I consider that the construction of a reservoir in the fields of Clatto Muir would not render the feuing value less, or decrease the saleable value of the Strathmartine estate. The reservoir, if made ornamental by a plantation, would improve the district. I do not think Strathmartine would sell well as a feuing or residential property. The land is rather poor. There is no probability that the site proposed to be taken for a reservoir would ever be feued. The water from the Dighty is not very pure, and it would therefore be rather an advantage for the owner of this estate to have pure water. The building on the higher level of Dundee is increasing very rapidly. I hold in my hand the different advertisements for the sale of the Strathmartine estate. I think that eight million gallons a day is a necessary supply for Dundee. I do not think it would be possible to enlarge the reservoir on the Law. It would involve the cutting off the cone of the hill, which is composed of whinstone rock.

Cross-examined: I was formerly opposed to the Clatto reservoir, but I was convinced of the necessity of it after we had a discussion with the engineers.

By the CHAIRMAN: There can be no doubt that the ratepayers of Dundee are strongly in favour of this proposition.

Mr. *J. A. Lake Gloag:* For several years I was factor on the estate of Strathmartine. I am well acquainted with the land proposed to be taken for this reservoir. I cannot see how it can injure the amenity to the estate. Although the reservoir is visible on the map, in nature the site is almost entirely surrounded by trees. The value of the land is about 30s. an acre. I let one of the farms at 33s. an acre, and the tenant became bankrupt. The number of mills now on the Dighty would render it impossible that the estate would ever be sold as a residential property. I do not think the site of the reservoir would ever be selected for feuing. It is a considerable distance from a road. The estate might be feued in the neighbourhood of the turnpike road or the railway station.

Cross-examined: I should think the site of the reservoir would be very unfavourable for a residence. A residence might be erected at St. Mary's, about half a mile from the reservoir. The farm-house of St. Mary's is at present let for nineteen years. I should not object to live in a house below this reservoir.

Several land valuers having been called to prove that no injury would arise to the estate from the construction of the proposed reservoir.

Mr. *Robertson* was recalled on the question of the proposal to increase the borrowing powers of the commissioners. He said: We seek power to borrow £150,000. We have found since obtaining the Act of 1872 that the cost of iron and wages have so increased, that we cannot complete the works within the previous estimate. As already stated, £63,000 of this sum will be required for the deviation of the works.

This closed the case for the promoters.

The following evidence was called on behalf of the petitioner:—

Mr. *Barstowe*, examined by Mr. ANDERSON.

I am a chartered accountant in Edinburgh, and have been six times president of that body. I have had considerable experience in the management of land. I am factor for Miss Laird of Strathmartine. The extent of the estate is about 2000 acres, and the average rental £2 an acre. In 1872 Miss Laird succeeded to the property. During the lifetime of Colonel Laird it was impossible to sell the estate, owing to the title being incomplete. Miss Laird is not in good health, and was desirous of selling the estate. In February last the property was exposed for sale; but it was done too hurriedly, and against my advice. In the meantime, this water scheme was set afloat. I have no doubt that this scheme has prevented the possibility of selling the estate. It would take at least a couple of years to construct, and no person would be likely to purchase the estate when so many men were at work. After it is erected it will be an unsightly thing, and likely to injure the property. There is a high embankment of 38 feet, looking like a fortification. I cannot conceive it possible for a mud embankment of such a height to be made ornamental. The exposure to the valley is not screened by trees. I think this is an admirable sight for a mansion house. In fact, it is the best site on the property. There is a considerable demand for feuing on the estate, and it is likely to increase. The site of the reservoir is suitable for feuing, and there is a road leading through the property. We feued four acres to Mr. Carmichael last year for £32.

Cross-examined: There would be no difficulty in supplying a mansion on the estate with water from the Gorrie Burn. I am not aware that that water is unsuitable for domestic consumption.

THURSDAY, MAY 14.

Mr. *A. Galloway*, examined by Mr. ANDERSON.

I am a valuator in Glasgow, and have been engaged in my profession nearly 50 years. I have valued lands taken for the purposes of reservoirs. I have examined the land proposed to be taken for the reservoir at Strathmartine, and have concluded that a mansion house can be placed with advantage right in front of the ground the Water Commissioners propose to acquire. A park which would surround the mansion house would embrace the site of the reservoir. No other position on the estate could compare with that one for a mansion house. The sites proposed by the commissioners witnesses yesterday were absurd. To introduce artificial lakes in that district and climate would be unwise. If a reservoir were placed in the position proposed the value of the estate would be much lessened, because the purchaser would be compelled to fall back on Strathmartine, which I consider a very inferior site. Nor would feuing be done in any place below the reservoir. He would be a rash man who would feu below that. The feuing on other parts of the estate would be affected.

Cross-examined by Mr. CLERK: When I visited the estate in April last, I was not told to fix on the site of this reservoir for a mansion-house; but I knew, of course, where the reservoir was to be placed. There are many houses at higher elevations than the elevation of this site, which is 500 feet above the sea level. I admit that at 500 feet the east winds are very severe. The gradients would also be very steep. The approach to the mansion would be about a mile. I do not know whether my proposed road would come out upon a feu already granted to Mr. Carmichael; but, if so, it could be easily altered. I do not know whether it comes out on any other feu. I expect that there would be no part of the gradient in the proposed road so steep as 1 in 15. There is already a cart road there, but I do not believe it is as steep as 1 in 18. I think it may be 1 in 24. This site which I have fixed upon is not on the extreme boundary of the estate. When I went down in April I had not been told that this estate had been put up for sale in whole or lots, and had not found a purchaser.

Mr. *Currer*, examined by Mr. ANDERSON.

I am a farmer, and reside near Edinburgh. I have during many years had the management of estates in Scotland. I also act as a land valuator. I have visited Strathmartine, and I think that the site of the proposed reservoir is the finest site for a mansion house on the whole property. No other site on the property is equal to it. A purchaser would be much more likely to buy the estate if the site were left open to him for a mansion house. I think an easy approach might be made to the proposed site. In my opinion the reservoir would be injurious to health.

Cross-examined by Mr. CLERK: Until I went to Strathmartine with Mr. Barstowe on this subject I had never been there in my life. Mr. Barstowe did not tell me that he had feued away this site for 19 years, nor that the shootings were let for 10 years. I have never known any farm in Scotland in the neighbourhood of a reservoir which has obtained a less rent in consequence of the reservoir.

Mr. ANDERSON proposed to put in certain reports showing that there had been differences of opinion between Mr. Stewart and Mr. Leslie.

Mr. CLERK objected to this being done. If Mr. Anderson wanted to have Mr. Stewart's opinions he should call Mr. Stewart himself, who was at hand.

Mr. ANDERSON said that, as Mr. Stewart was still connected with the commissioners, he felt it would be invidious to put him in the box against the commissioners. In these circumstances the commissioners ought, in fairness even to the committee, to have called Mr. Stewart to show that there was a difference of opinion among the engineers. However, although unwillingly, he would call Mr. Stewart.

Mr. *Stewart*, examined by Mr. ANDERSON.

I am joint engineer of the Dundee Water Commissioners, and gave in a report on these works in 1873. [*Witness* proved the report and the letters which had passed between him and the commissioners.] These reports and letters correctly represent my opinion at the time they were written.

By Mr. CLERK: Since then the commissioners have resolved to alter the distribution of the water, and I have reported that in that case a reservoir outside the town is indispensable. It would not be safe to have such a line of pipes as we propose from Lintrathen without a storeage reservoir.

Mr. ANDERSON then addressed the committee on behalf of the petitioner, and urged that the existence of the proposed monstrosity on the best part of the estate—a monstrosity which might at any moment burst its sides—would very much reduce the value of the property. He submitted that the commissioners had not made out a case for such a reservoir as was proposed, and that even if such a case had been made out, no case had been made out for placing the reservoir on this property. When the commissioners got the bill for the Lintrathen works in 1871, no such thing as this reservoir had been foreseen. Mr. Bateman had suggested a reservoir of some kind, but it was on the Law, and not here. Why had Mr. Bateman not been called in support of this scheme?

Mr. CLERK said that he did not think it at all necessary to call Mr. Bateman; but one reason for not calling him was his absence in Italy.

Mr. ANDERSON said that in their reports Messrs. Leslie and Stewart stated that for equal distribution only the reservoirs now existing and that proposed to be built on the shoulder of the Law were necessary, and the commissioners had shown no reason why that opinion of Messrs. Leslie and Stewart should be set aside. He afterwards criticized in detail the various reports by Messrs. Leslie and Stewart on the question of a distributing reservoir. He contended that the board had resolved that a supply of eight million gallons a day from Lintrathen was necessary for Dundee, and that they put strong pressure on Mr. Leslie to give that supply and a distributing reservoir at Clatto in case of a fracture. He maintained that a reservoir to supply ten days, at the rate of eight million gallons a day, was absurd. According to the evidence of Mr. Watson, the reservoirs at Monikie were capable of holding ninety days supply, and that was available for the lower and middle districts. If the pipes from Gagie were doubled, an abundant supply might be given to the whole of Dundee, for the inadequate supply in the high district was due to the want of water, which would be obviated by the addition from Lintrathen.

The CHAIRMAN: I apprehend that you mistake Mr. Watson's evidence. It is because the pressure is diminished by the escape at the lower level that there is a necessity for three levels.

Mr. ANDERSON said that one of the alleged uses for the reservoir would be for serving the higher districts, and that could be more effectually done by a reservoir on the Law. Mr. Watson had stated that it was not necessary for equalizing purposes. Therefore the only use for the reservoir would be as a clear water basin; and, as Miss Laird had the greatest possible objection to the reservoir, he did not see why Auchterhouse should not be selected as the site, seeing that the Earl of Airlie was willing to give the land. He therefore respectfully submitted that the promoters of the bill had not made out their case.

The COMMITTEE, without hearing Mr. Clerk in reply, directed the room to be cleared, and on the parties being recalled, declared the preamble proved.

The clauses were then settled, and the bill ordered to be reported.

TUESDAY, MAY 19.

(*Before Mr.* ELLICE, *Chairman; Colonel* DYATT, *the Marquis of* STAFFORD, *and Mr.* BRUCE.)

DUBLIN CORPORATION WATER BILL.

The Hon. GRANVILLE SOMERSET, Q.C., and Mr. NORWOOD appeared for the promoters; Mr. PEMBROKE STEPHENS for the Alliance and Dublin Gas Company; and Mr. HOLMES (with Mr. STEPHENS), for the Wicklow, Wexford, and Waterford Railway Company, petitioners against the bill.

At the opening of the proceedings, Mr. KEOGH, a solicitor, on behalf of the above-named railway company, took an objection, on the ground that the bill was not properly before the committee. This was not the bill referred to them. After the second reading, the whole of the bill, as introduced into the House, with the exception of two clauses, was struck out, and manuscript clauses were substituted for the expunged clauses, of a totally different character, and therefore this was a new bill altogether, which could not come before the committee unless the Standing Orders were suspended.

The CHAIRMAN: Has the bill, as altered, been before the officers of the House?

Mr. SOMERSET: The altered bill has not only been before the officers of this House, but before Lord Redesdale and the officers of the House of Lords, who never made any objection to it. Lord Redesdale made a trifling alteration in the form, but not in the substance of the clauses, and the bill so altered having been approved of, is now submitted to the committee.

Mr. KEOGH: We received a letter from the agents of the promoters, informing us that all the clauses to which we objected and had petitioned against had been struck out of the bill, and now we find that several new clauses, likely to injuriously affect us, have been substituted for those to which we had previously objected.

Mr. SOMERSET: You appear to be complaining that you have not a grievance.

Mr. KEOGH: This is not a mere amendment of existing clauses. Under the new manuscript clauses we, as the largest ratepayers in the townships to which the promoters propose to supply water, will be injuriously affected.

Mr. SOMERSET: Your objection is to the merits of the bill.

Mr. KEOGH: We say that the new clauses are inconsistent with those that were struck out.

The CHAIRMAN: Were the railway company originally petitioners against the bill?

Mr. KEOGH: Yes.

The CHAIRMAN: Will not your petition enable you to appeal against the altered bill?

Mr. KEOGH: I submit that the bill contains wholly new matter, and that this is, therefore, a totally new bill, and not a mere amended bill.

Mr. SOMERSET: We have no objection to your being heard against the bill as it stands.

The CHAIRMAN: I think I have never known a case of this kind before, where not only nearly all the clauses are cut out, but the greater part of the preamble. I should not be disposed to ask the committee to come to any decision on this bill.

Mr. SOMERSET instanced a case in which he had known 400 clauses cut out of a bill. The present bill had been before the proper officers of the House, and also before those of the other House, and by both those bodies it had been submitted to the committee. If the committee thought the bill presented matter for inquiry, of course he had nothing to say.

After some further conversation on the point, the chairman consulted with Mr. Rickards, one of the referees, and then called on Mr. Somerset to show cause why the committee should go on with the bill, which was not the original bill.

Mr. SOMERSET: I submit that it is not for this committee to decide whether they will go on or not. It is submitted to them as a committee by the proper authority, and I say, with respect, that all you have to decide is as to the merits or demerits of the bill. Assuming that none of the Standing Orders had been complied with, even then, if there had been no objection taken until the bill came before the committee, you could not decline to hear the bill. The position of things was this. It was important that the Dublin Corporation, who supply water in Dublin, should obtain a bill for certain purposes; but it was considered very advantageous that the power they required should be got through the instrumentality of a Provisional Order; one was, consequently, sought to be obtained from the Local Government Board, and an officer was sent down from the board to make inquiries in Dublin. There are certain powers which can be obtained under a Provisional Order. It was thought advisable that the required powers should be obtained in that way, because by that means a double inquiry would be obviated, and the expenses would be lessened. You can understand how much better it is to have a local inquiry instead of coming to London. Well, the inquiry by the commissioners was advertised, and the reasons for promoting the bill and what the order which was sought would contain were published, and the opponents to the scheme could have made themselves acquainted with these facts. You may take it, if you will, that the Provisional Order contains the clauses struck out of the bill. The manuscript clauses owe their existence to the fact that this was the first Provisional Order ever obtained in Ireland, and those who sought for it had no experience whatever with regard to such matters. They inserted in the bill, believing it to be necessary, the clauses they obtained in the Provisional Order, and some of which have now been struck out of the bill. No one has been injured, because full notice was given of what was about to take place, and the Provisional Order could have been opposed just as a bill can be before you. The manuscript clauses could not be inserted in the Provisional Order, and that is why we are here. In conclusion, I respectfully ask you, if you have any doubts on the subject, to submit the matter to the authorities of the House, and obtain full information on the point.

The CHAIRMAN: Did I understand you to say that some clauses had been left out in consequence of their becoming useless?

Mr. SOMERSET: I did not say that; I said the Local Government Board had not power to sanction all the clauses to give that authority which the Houses of Parliament have power to grant under certain circumstances.

The CHAIRMAN stated that he would give the opinion of the committee upon the point raised, the following morning.

WEDNESDAY, MAY 20.

Mr. STEPHENS said he appeared for the Alliance Gas Company. In the course of the proceedings yesterday he had been anxious to reserve the rights of his clients, and he now thought it proper, in the state of things which had arisen, to put before the committee the position which they occupied. They had had an opportunity of looking carefully through the amended bill and carefully considering it, and in the first instance they thought the alterations were very great; but, having gone through them and compared them with the original bill, and having satisfied themselves that the utmost that could result was the delay which would be occasioned by the withdrawal of the bill and the presentation of another, they did not deem it right to object in any way to the present form of the bill.

Mr. SOMERSET was about to offer an observation, but

The CHAIRMAN said: Perhaps you will consider it unnecessary to make any statement at all after you have heard what I have to say. I have thought the matter over, and I find that the practice has varied. There are very few instances in which bills have been produced before a committee in the shape of the present bill, and I find that the usual practice has been to withdraw the

bill and submit another. On the other hand, two years ago, in the case of the European Assurance Company, in which the same thing happened, the committee decided to go on with the bill. If I am satisfied here that no injury will be done to the parties who are opposing the bill, I think that on the whole it is better to allow the bill to go on. Delay would only entail inconvenience, without leading to any practical result. It must be understood, however, that no objections to matter of form, or to the *locus standi* of the opponents, are to be taken.

Mr. SOMERSET said the petitioners were now willing that the bill should proceed in its present form, and he proposed now to bring the merits of the case before the committee. The bill as now presented first of all recited the Acts of 1861, 1863, 1866, and 1870, the different water-works Acts under which the Corporation of Dublin at present supplied water to the city of Dublin and portions of the surrounding districts. He desired next to call their attention to rider A of the preamble, a manuscript portion of the preamble which succeeded the printed portion, and he would state as shortly as he could what it was they proposed to ask Parliament to sanction. It commenced by setting forth that the Dublin Corporation Water-Works Act of 1861 incorporated the Water-Works Clauses Act of 1847, except the sections with respect to payment and recovery of water-rates and those which related to the amount of profit to be received by the undertakers where the water-works should be carried on for their benefit. It then proceeded to recite that, under sections 35, 36, and 37 of the Water-Works Clauses Act of 1847, which related to the supply of water, owners of property, under certain terms and conditions prescribed by that Act, might demand a supply of water from the corporation, which it might be inconvenient or physically impracticable to give in certain portions of the district defined by the Dublin Corporation where the provisions of the Act of 1861 were to be carried into effect. Of these clauses, clause 35 was the important clause, as it provided for a constant supply of water. Such obligation required some modification. The district embraced by the bill was a very extensive one, measuring 28 miles in length by 20 in breadth, and comprising many places which did not want much water. What the promoters proposed to do was to except from the duties that would be imposed upon them under clauses 35, 36, and 37 of the Act of 1847 certain places where a supply was not necessary, being very sparsely populated, or containing mountainous districts; and, though the promoters had now plenty of water, still Dublin and its suburbs were fast increasing in their population and in their requirements, and the promoters did not want to be under liabilities, which they would probably never be called upon to fulfil, but for which they would, nevertheless, have to make their calculations and arrangements. Under these circumstances they proposed the arrangement to which he would call the attention of the committee, and which was contained in the second manuscript clause. It was as follows:—"Under the 4th section of the Dubin Corporation Water-Works Act, 1861, the Water-Works Clauses Act, 1847, was incorporated therewith, except the sections with respect to the payment and recovery of the water-rates, and except the sections with respect to the amount of profit to be received by the undertakers where they were carried on for their own benefit. Clauses 35, 36, and 37 shall not apply to any extra municipal district defined in the Act of 1861, except the districts included in the townships of Pembroke, Blackrock, Kingstown, Dalkey, Bray, Kilmainham, and Clontarf." The second manuscript clause thus set forth the places where the obligations imposed by the Act of 1861 would still remain in force. He would endeavour, if possible, to remove all the complaints made on behalf of the Wicklow Company, and he would call the attention of the committee to a letter written by Mr. Holmes, who was the parliamentary agent of the Dublin and Wicklow Company, and bearing date a few days ago. Mr. Holmes said that the Dublin and Wicklow Company could not consent to the new bill proposed to be submitted to the committee, but he had instructions to withdraw their opposition, provided the words "Killiney and Ballybrack" were inserted in the new clause 2, after the word "Kilmainham." Well, his clients (the promoters) had no objection to insert those words in the clause, though the people of the two places thus named were quite satisfied with the clause as it stood. He now came to the provisoes which had been added to this clause by Lord Redesdale. They were to the following effect:—"Provided always that the corporation shall not hereafter have power to oppose any persons, companies, or incorporated body seeking parliamentary powers to obtain a water supply for any place or district excluded hereby; and the corporation shall be bound, should any persons or associated body resident in such district apply to the corporation for a supply of water, on condition of their laying down the requisite pipes and mains for conveying such water from the mains or tanks of the corporation at their own expense, to give the parties applying a right to take such water from the corporation mains for distribution for the use of the district, to the same extent and at the same charge, not exceeding 6d. per 1000 gallons, as it is now supplied with water by the corporation. Provided further, that the corporation shall not be bound to afford any supply if their doing so should endanger their power of fulfilling and maintaining their obligation to supply the city of Dublin and the extra-municipal districts with water." These provisoes had been inserted by Lord Redesdale. The promoters did not deem them at all necessary, but they bowed with respect to any suggestions or requirements by Lord Redesdale, and readily accepted them. They would make no change in the general working of the bill. He understood that the sole objections which the Wicklow Company entertained with regard to the new clauses of the amended bill were with regard to the provisoes to which he had referred. So far as the promoters were concerned, they were willing that the provisoes should be omitted, if Lord Redesdale would consent to it. He came now to the manuscript clause 3. The necessity for this clause was explained in another recital contained in rider A to the preamble. The Corporation of Dublin, in consequence of irregularity and delay in the collection of the water-rates, had been obliged to borrow money, and doubts had arisen whether the interest on the advances so made could be charged on the ratepayers. The rates were struck in January, and were payable in four quarterly instalments, commencing on April 1; but money was wanted on account of the water-works for various purposes, and, first of all, to repay Government advances. The money for the rates did not come in before April, and, in the meanwhile, the corporation had to go to bankers and borrow money, at interest, to meet the wants of the Government. The interest on that money had to be charged on the ratepayers; but the auditor of the corporation, who was a public accountant and Government official, doubted whether the money could be legally paid out of the rates, and it was to remove those doubts that the new third clause had been introduced. It was as follows:—"The corporation are hereby authorized and empowered to pay interest on the temporary advances, provided always that such advances shall not be made or applied for in any current half year to an amount exceeding £3000, or, in the aggregate, that no advances at any one time shall exceed £5000. The interest thereon shall not be payable at a higher rate than the current rate payable at the time being." If they did not get that power they would be in this position: They would be unable to meet their engagements with the Government, and the Government would be so far without their money for a certain time. So far as he was aware, the Dublin and Wicklow Company did not object to that power, and he did not know that Lord Redesdale did; and, so far, it was unopposed. In conclusion, he wished to refer to sections 12 and 13 of the original bill, and to explain that the first of these was the same in effect as the manuscript clause 2, while clause 13 was the same in substance as the new or manuscript clause 3.

Mr. *Nugent Robinson*, examined by Mr. SOMERSET, said he was treasurer of the city of Dublin, and an officer of the corporation. For many years he was secretary of the Water-Works Committee of the corporation. Was thoroughly acquainted with the affairs of the committee, and with the accounts of the corporation. Was aware that there was irregularity and delay in the collection of the water-rates in Dublin. The rates began to come in in a large quantity between April and July, and they declined until November. The corporation had been obliged, from this circumstance, to obtain advances from bankers. These advances were absolutely necessary, and saved money to the corporation, and, therefore, to the ratepayers. The public auditor was appointed under an Act of Parliament, and was independent of the corporation. The Local Government Board had control over the auditor. They reversed the decision of their auditor, being of opinion that the committee had acted *bonâ fide*.

The CHAIRMAN: I do not think there is any opposition on this part of the bill.

Mr. SOMERSET: We thought it advisable, under the circumstances, to put this gentleman into the box as soon as possible.

Witness: It was absolutely necessary that the committee should pass clause 3.

By Mr. KEOGH: The average rate of interest paid by the corporation was 4½ for money borrowed. To his knowledge they had never paid more than 6 per cent. The Act under which the auditor was appointed applied generally to Ireland, but the clause would render the corporation independent of the Act.

Re-examined by Mr. SOMERSET: No one in Dublin had objected to the clause.

Mr. *Parke Neville*, examined by Mr. SOMERSET.

I am a civil engineer, and have been surveyor of the corporation for the last 20 years, and have been engineer to the water-works since 1861. I carried out the water-works scheme. [Witness explained the limits of the water-works scheme on the map to the committee.] None of the excluded persons objected to the exclusion. They did not oppose. The excluded places are supplied under their local Acts. If the Wicklow Company wish Ballybrack and Killiney to be included, the corporation have no objection. Dublin, especially in the suburbs, is largely increasing, and requires an increased supply of water.

By Mr. KEOGH: We propose to get rid of certain of the restrictions imposed by the Act of 1847. We should have been freed from these restrictions in 1861 had we asked for it. Killiney and Ballybrack, although they have no special Water Act, are incorporated, and are, therefore, at liberty, to supply water to themselves.

Re-examined by Mr. SOMERSET: The original bill presented to Parliament contained clauses for the repeal of the restrictions in the Act of 1847. We thought the clauses in our Act of 1861 took us out of the Act of 1847, but we have been advised by competent authorities that that is not the case.

This was the case for the promoters.

Mr. KEOGH then addressed the committee on behalf of the Dublin, Wicklow, and Wexford Railway Company, in opposition to the bill. He complained of the course that had been adopted by the promoters in withdrawing clauses which affected his clients, and their substituting for them clauses which affected them in a different manner. The Provisional Order had been obtained behind the backs of his clients, and he had only seen it yesterday. He could not help regarding the conduct of the promoters as being something in the nature of double-dealing, they having pretended to withdraw all the objectionable clauses with one hand, whilst they tried to get them re-enacted with the other.

The CHAIRMAN: We have nothing whatever to do with the Provisional Order, except that the promoters put it in to show that they have obtained it. It does not concern us, neither do I understand that the bill proposes to do anything under it.

Mr. KEOGH said he was merely referring to the Provisional Order in order to show that the circumstances under which his clients had agreed to withdraw their opposition to the bill had altogether changed.

Mr. SOMERSET: The Provisional Order cannot become law until it has been laid before Parliament for a certain period, during which the railway company will have ample opportunity of objecting to it.

The CHAIRMAN: We have nothing to do with it now.

Mr. KEOGH remarked that the first manuscript clause in the bill proposed to repeal the restrictions contained in the Act of 1847, and the second clause contained entirely new matter.

Colonel DYOTT: I understood that Lord Redesdale amended the clause.

Mr. SOMERSET: So he did.

Mr. KEOGH said he had considerable doubts on the subject.

Mr. SOMERSET: Then I will call Mr. Muggeridge, who will let us know the exact circumstances.

Mr. *Muggeridge*, examined by Mr. SOMERSET, said he was the parliamentary agent for the promoters; the second clause had been amended by Lord Redesdale.

By Mr. STEPHENS: The object of the second clause was to secure the inhabitants of the districts which the corporation might not supply, and to enable other companies to suply them with water.

By the CHAIRMAN: Lord Redesdale did not make any inquiry as to whether notice had been given of this clause to the inhabitants of the district in question.

Mr. KEOGH objected to the 3rd clause, as empowering the corporation to borrow money in an illegal and exceptional manner. He trusted, under these circumstances, that the committee would find that the preamble was not proved.

Mr. STEPHENS, on behalf of the Alliance and Dublin Consumers Gas Company, having promised that, if necessary, his clients would oppose the Provisional Orders elsewhere, urged the committee to secure the pipes of the company from being injured by the corporation when laying their water-pipes.

Mr. SOMERSET said he understood that his learned friend had withdrawn from opposing the bill.

The CHAIRMAN: He does not oppose; he only seeks that his clients should be protected.

The room was then cleared, and on the readmission of the parties,

The CHAIRMAN said the committee had been considering the preamble, more especially in reference to the districts, and clause 12, which was somewhat more extensive in its character than they approved. They had, however, come to the conclusion to declare the preamble proved, and to give the promoters the borrowing powers they asked for.

The clauses were then settled, and the bill ordered to be reported.

PURIFICATION OF MINERAL OILS.—M. Masson proposes a new method for the purification of mineral oils. The plan he adopts is that of submitting them to a mixture of alcohol and sulphuric and nitric acids. Petroleum, thus purified, is fitted to replace alcohol in a great number of preparations, as, for example, in making tinctures for external application.—*Comptes Rendus.*

EXPLOSION OF GAS AT CHELMSFORD.—On Friday last St. John's Church, Moulsham, which has been undergoing extensive enlargement, was seriously damaged by an explosion of gas. Some men were engaged in laying down fresh gas-piping, and it is supposed that there was a leakage of gas from one of the pipes, and that some one must have gone near it with a light. Shortly after three o'clock there was a frightful explosion in the centre of the building. The side-windows were broken out, and the whole of the centre pews blown to splinters, the building presenting a shocking scene of wreck and disaster. A portion of the fine coloured east window was blown out, and the flooring in a great part of the building torn up, but, fortunately, the walls were not damaged. The loss is covered by insurance.

Legal Intelligence.

VICE-CHANCELLOR'S COURT.—Friday, May 22.

(Before Vice-Chancellor Bacon.)

THE ATTORNEY-GENERAL *v.* THE COPORATION OF BIRMINGHAM.

Mr. Pearson, Q.C., and Mr. Cozens Hardy appeared for the corporation; Mr. Eddis, Q.C., and Mr. Rodwell for Sir C. Adderley.

Mr. Pearson moved that the sequestration in this case should not issue until after the first motion day in Trinity Term, 1875. It may be recollected that the Corporation of Birmingham are under injunction, in an information at the relation of Sir Charles Adderley, restraining them from discharging sewage into the river Tame, so as to cause a nuisance, and to enforce the injunction a sequestration was also ordered to issue, the carrying out of which order, however, has been from time to time suspended in order to allow the corporation time to contruct works. The corporation are also under injunction in another information restraining them from carrying out certain sewage works on a farm obtained by them near Birmingham, which were found to be a nuisance to the neighbourhood of Graveley Hill, a suburb of Birmingham. The relators in that information had consented to giving further time to the corporation. The present application was based on evidence to show that the corporation had been as diligent as they could be, and were taking steps likely entirely to abate the nuisance complained of. Adopting a plan recommended by Mr. Hawksley, they have already constructed one enormous compound defecating tank in four compartments, and have contracted for the construction of three other such compound tanks, the first of which is to be completed by the 30th of September next, the second by the 31st of January, and the third by the 30th of May next year. The compound tank now in work discharges four million gallons of defecated sewage daily into the river Tame. Each compartment uses at every operation 13 tons of lime. Such operations are conducted by allowing the sewage to stand in a compartment till by the aid of the lime and gravity the greater portion of the impure constituents sinks, and the liquid is drained off, and the solid residue is then removed and used for farming.

Mr. Eddis said he had no objection to the matter standing over until the first day of Michaelmas term, in order to see how the tanks already made would succeed. The plaintiff was apprehensive that though this system of dealing with the sewage would answer in fair weather, it would be utterly inefficient in case of storms.

The Vice-Chancellor observed that a public body and a person in the position of Sir. C. Adderley ought to be able to make a mutually satisfactory arrangement. He was sure that where there was a will there was a way, and he was certain there ought to be no such litigation between such parties.

Mr. Eddis said he would take care that his honour's observations should be communicated to Sir C. Adderley.

It was then arranged that the motion should stand over till the first motion day after the 31st of January next, and that the sequestration should not issue in the meanwhile.

Saturday, May 23.

Before Vice-Chancellor Malins.

Re PATENT GAS COMPANY AND COMPANIES ACTS.

Mr. Glass, Q.C., said that since the petition had been presented meetings had been held, and resolutions passed for the winding up of the company, continuing the *interim* liquidators.

Mr. Cotton, Q.C., appeared for the company, and consented.

Mr. Higgins, Q.C., who represented shareholders, did not oppose; neither did Mr. Brooksback, who likewise appeared for shareholders.

The usual winding-up order was then made; all parties appearing to have their costs out of estate.

COLCHESTER POLICE COURT.—Monday, May 18.

(Before the Mayor, Mr. E. A. Round, *and a Bench of Magistrates.)*

ILLEGALLY LAYING ON GAS.

Mr. *Samuel Smith*, landlord of the Grosvenor Hotel, Maldon Road, was charged with stealing 5900 cubic feet of gas, the property of the Colchester Gas Company.

Mr. H. Goody appeared for the gas company, and Mr. H. Jones for the defendant.

Mr. Goody said he appeared in support of the information, and the Bench would hardly understand the arrangement he was about to ask the Bench to sanction, unless he briefly explained some of the circumstances. Some short time since the company had occasion to summon Mr. Smith for arrears of gas account, and before the case came on for hearing he went to the company's office and paid the amount due with the cost of the summons. At that time the pipe connecting the meter with the main had been cut off, and the Act of Parliament requiring that a deposit should be made before it was laid on, £5 was demanded, and defendant offered the clerk £2, but this was considered inadequate for the winter quarter, and refused. According to defendant's statement he then told the clerk that the amount tendered was equal to his consumption, and that if no one else laid on the gas he should do it himself; but that statement, he (Mr. Goody) was bound to say, the clerk denied. The question for the Bench would be, whether, after that statement of the defendant's that he thought he had a right to put on the gas, his action would really amount to a felony. After the statement which would be made by Mr. Jones on defendant's behalf, the gas company were not desirous of pressing the charge. Defendant, in his stupidity, having connected the pipes, they had no wish to press the case from a criminal point of view. Defendant had agreed to pay for the gas he had consumed, and the expenses incurred in the matter, and so, with the sanction of the Bench, the matter would drop; but he (Mr. Goody) wished it to go forth to the public through the press that persons would bring themselves within the Act of Parliament if they took upon themselves to reconnect gas-pipes.

Mr. Jones said there could not be a question as to defendant's liability to pay for the gas consumed, and inasmuch as he had been guilty of that irregularity, he thought it right he should pay the costs, and he thanked the company for allowing the matter to drop in that way. Defendant felt that if he offered a reasonable sum he had the right to take the gas whether with or without the company's consent, whereas it was quite certain that had the company demanded an exorbitant sum as deposit, he would have been obliged to pay it before he could have the gas laid on. As it was, he cheerfully accepted the lenient course the prosecution had chosen to take.

The Bench assented to the course proposed, the case being formally adjourned to ascertain the amount of his liability.

Mr. *Robert Howe*, gas-fitter and brazier, Long Wyre Street, and Mr. *Frederick Warmington*, leather seller, High Street, were summoned by the Colchester Gas Company for connecting a pipe without giving legal notice.

Mr. H. Goody said the charges were laid under the Consolidation Act, 10 Vic., cap. 15, which enacted that any person who should lay, or cause to be laid, without giving notice, a pipe communicating with any pipe belonging to the gas company should forfeit a penalty not exceeding £5. It appeared that Mr. Warmington had occasion to have his gas-meter shifted from one part of the room to another, and employed Mr. Howe to do the work. While the job was in course of progress, Mr. T. Browning, the gas company's manager, happened to pass, and told him that the Act of Parliament required a notice to be sent to the office before the work was done. Mr. Warmington told Mr. Howe's man to tell his master to communicate with the gas office, Mr. Browning having been there, and it now appeared that the man neglected to deliver the message to his master or to the office. Under these circumstances the company had no wish to proceed for a conviction. Mr. Warmington was well known as a gentleman who would not evade the law, and, feeling that after Mr. Browning's visit he should have given the notice himself, had made the *amende honorable*, and had agreed to pay the costs. Mr. Warmington was the person primarily liable, and all the company wanted was to let the public know that meters could not be removed and pipes connected without notice was given.

There was a second charge against Mr. Howe of a similar character in reference to fixing a meter at Mr. Fieldgate's, East Hill.

Mr. Goody said Mr. John Robert Bedwell, a very respectable gentleman, the owner of the premises, went to Mr. Howe's, selected a meter, and directed the defendant to fix it. As it was necessary to disconnect the plug, Mr. Howe said it would be necessary to give notice at the gas office, and Mr. Bedwell, requiring the work to be done *instanter*, undertook to attend to that point; but he forgot to do so, and had told him (Mr. Goody) that he felt in honour bound to take upon himself the accruing responsibility.

Mr. Jones, on behalf of the defendant, said Mr. Howe wished it to go forth that heretofore he had always given the necessary notice, and in future all that was requisite and necessary should be done.

The Bench dismissed the cases, the Mayor remarking that in none of them did they think there was any felonious intention.

AN OUTGOING TENANT'S ACCOUNT.

Mr. *Edwin Faiers*, shopkeeper, East Hill, was summoned for £5 6s. 6d., the amount of his liability to the Colchester Gas Company.

Mr. H. Goody appeared for the company, and Mr. Asher Prior for the defendant.

It appeared that Mr. Faiers and a Mr. Strutt exchanged premises, and at the time of the transfer mutually arranged to take the respective gas accounts pertaining to their new possessions. The defendant shortly afterwards discovered that there was a considerable arrear due from his predecessor for gas account, and then demurred to a settlement. At his request the gas-meter was sent to London and tested, and for the disconnection, packing, carriage, &c., the sum of 7s. was charged, and the result of the examination proved that the meter registered 12 per cent. against the company.

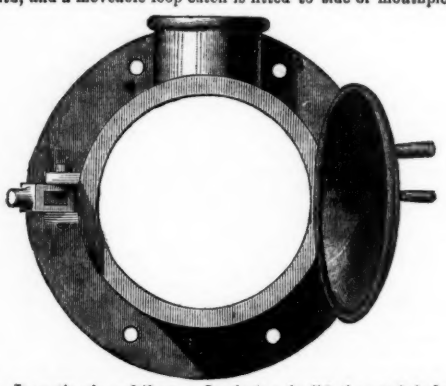
Mr. Wittey (clerk to the Bench) advised the magistrates that the liability defendant assumed on taking possession was recoverable only by county court action

It was then agreed that defendant should pay the amount of his account for gas since entering into possession—14s. 11d.; for the testing of the meter, 7s.; and 6s. 6d. costs; altogether £1 8s. 5d.

Miscellaneous News.

HOLMAN'S PATENT ANTI-FRICTION CATCH TO MORTON'S SELF-SEALING RETORT-LIDS.

We illustrate an improved fastening now adapted to these well-known retort-lids, which are greatly rising in the estimation of gas engineers in this and foreign countries. Mr. Holman's original patent fastening, which was exceedingly effective, is now improved by the employment of a moveable instead of the original fixed catch. In the old arrangement, an eccentric washer or cam on the lower end of the hand lever, by coming in contact with a stud fixed on bottom side of cross-bar, lifted the cross-bar or latch in or out of the fixed catch on the mouthpiece. This eccentric washer and stud are now both dispensed with, and a moveable loop catch is fitted to side of mouthpiece with a



hinge pin. Its action is as follows:—In closing the lid, the catch is first shifted sideways, as shown in illustration, the lid is then closed in the ordinary way, and the catch drawn over the end of cross-bar, the lever set in which, being eccentric in its hinge bearing, seals the joint effectually, the new catch moving laterally with the cross-bar, thus removing the great frictional bearing which was caused in the old method by the cross-bar sliding along the fixed catch. We understand that the improvement is looked upon with favour by many gas engineers who have used this lid with the original fastening, and by others who are now adopting it for the first time.

Strange Charge against a Gas Manager.—About three weeks ago a petition was presented to the Accrington Local Board, asking them to cause an inquiry to be made into a disparity of the consumption of gas by the street-lamps in 1872 and 1873. The Lighting Committee of the local board met to investigate the matter on the 18th inst. in the presence of a large number of ratepayers. At this meeting a charge of fraud was brought against the manager of the gas-works by a discharged servant of the company, who is now the gas inspector of the local board, and who alleged that in January, 1872, he made a return of the gas consumed by the public lamp meters, and the manager altered the figures to represent 1900 feet more gas registered than they represented, to which he (the inspector) had to alter the meters. The board had 261 lamps at that time, and it made a difference of 23,615 feet of gas. In June and December he again altered the meters, which made it appear that the lamps had consumed 22,344 feet and 34,191 feet of gas respectively, or a total in all of 80,478 feet of gas which had never gone through the meters. The chairman of the gas company, who is also chairman of the local board, indignantly denies the truth of these statements, and, on behalf of the company and their manager, proceedings are threatened against the originator of the calumny. A second meeting of the Lighting Committee was held on Wednesday last, the manager, acting under legal advice, declining to attend, and in the result the whole question was referred to the board to deal with.

METROPOLIS GAS SUPPLY.

METROPOLITAN BOARD OF WORKS.—At the meeting of the board, on Friday last—Colonel Hogg, M.P., in the chair—a deputation attended to present a memorial from consumers in the South of London, complaining of the price charged for gas in the Phœnix Company's district, and requesting the board, as the local authority for the metropolis, to institute an inquiry as to how far that company were complying with the provisions of their Acts in increasing the price. Mr. C. M. Barker addressed the board on behalf of the deputation, and fully explained their object, and said that in one parish the inhabitants on one side of a street paid 3s. per 1000 feet, while the residents on the other side of the road were charged 4s 6d. This, he thought, showed clearly the necessity for an inquiry. Mr. Fowler moved that the memorial be referred to the Works and General Purposes Committee. Mr. E. Dresser Rogers seconded the motion. Mr. C. Harris said that he did not object to this matter being referred to the Works and General Purposes Committee, for he was quite sure that the Phœnix Gas Company, and he, as one of their directors, courted inquiry, not only as to their funds, but as to the mode in which they conducted their business. He would make no reply to the observation which had been made by Mr. Barker on behalf of the deputation, further than to say that the company would be happy to give to the board every opportunity for investigation in their power. He assured the board that no one could be more sincere in their desire to reduce the price of gas than the Phœnix Gas Company, and, in conclusion, he said that on and after Midsummer next the price would be reduced from 4s. 6d. to 4s. 2d. per 1000 feet. The motion to refer the memorial to the Works Committee was then agreed to.

KENSINGTON.—A public meeting, convened by the "West London Gas Consumers Association," was held on Monday evening, May 18, at the vestry hall, for the purpose of considering the question of the price of gas in the district. Sir Charles Dilke, M.P., occupied the chair, and, in opening the proceedings, he said he saw no remedy for the evils of the monopoly now possessed by the gas companies but the placing the manufacture of gas in the hands of some public body representing the ratepayers and gas consumers of the metropolis. It was a mere waste of time to meet, on every occasion when a gas company raised the price of its gas, for the purpose of protesting against such increase. Something more definite and practical was required. Mr. W. Gordon, M.P., then moved the following resolution:—"That, in the event of no steps being taken in Parliament to remedy the evils arising from the existing gas Acts, it is essential that the gas consumers adopt immediate measures for taking the manufacture and supply of gas into their own hands." He thought, in the first instance, a deputation should wait upon the Board of Trade, and if no satisfactory reply could be obtained from that board, then that the Association under whose auspices they were meeting that evening, should at once prepare a scheme to carry out the last clause in the resolution. Mr. Curzon seconded the resolution. In fighting the gas monopoly they would have no easy task, and they must be prepared for an arduous struggle. He had no doubt of ultimate success, and instead of paying, as they now were, 6s. 3d. per 1000, it would be obtainable at from 2s. 6d. to 3s. per 1000. Mr. James Beal suppported the resolution, and in so doing gave a long account of the rise and progress of the existing gas companies, and the legislation under which those companies obtained their present monopoly. He pointed out that any scheme such as that suggested in the resolution must, to be successful, be taken up by the combined vestries of the metropolis, and not by any local or isolated body. Mr. R. Freeman, of the Metropolitan Board of Works, also supported the resolution. He was opposed to any mere spasmodic action, but the next movement must be a united one on the part of all the public bodies of the metropolis. The resolution was adopted unanimously, and other resolutions were also agreed to in accordance with the object of the meeting, and especially in relation to the formation of a great metropolitan organization to promote a bill in Parliament for the repeal or the amendment of the existing gas legislation.

METROPOLIS WATER SUPPLY.

Major Bolton's report for the month of April states that the condition of the river at Hampton, Molesey, and Sunbury, where the intakes of the West Middlesex, Grand Junction, Southwark and Vauxhall, Lambeth, and East London Companies are situated, was very good from the 1st to the 4th, and indifferent from the 5th to the 13th, when it gradually improved; it became very good on the 21st, in which condition it remained for the remainder of the month. The highest flood state of the river at Hampton during the month was 10 inches above the (6 feet) summer level, and the lowest 3 inches below. At Ditton the state of the water in the river during the month was good for 12 days, indifferent for 7 days, and bad for 11 days, but it was generally affected by the turbid state of the rivers Mole and Rye, which rendered the water of the Chelsea Company extremely difficult to filter. This company is now the only one whose intake is influenced by the highly objectionable waters of these rivers. The highest state of the flood water at this place was 1 foot 4 inches, and the lowest, summer level. The highest temperature of the water during the month was 62°, and the lowest 48°, while the highest temperature of the air at the same place was 74°, and the lowest 42°. These observations were made daily at 9 a.m. The rainfall during the month was half an inch. The water at the Thames intakes was very turbid during the early part of the month, when the river was flooded, and the utmost vigilance had to be exercised by those Thames companies not having ample subsiding and storeage reservoirs, to prevent the choking up of their filter-beds after taking in flood water. The West Middlesex Company is the only one at present which, having large reservoir capacity, avoids taking in water during floods. The Lambeth Company are making large subsiding reservoirs at Molesey, and the construction of additional subsiding and impounding reservoirs by the Chelsea, Grand Junction, and Southwark and Vauxhall Companies is most desirable, so that when the river is in a turbid condition the flood water may be allowed to pass. The Kent Company have completed the order of the Metropolitan Board of Works with respect to affixing hydrants to the mains in the portion of the company's district at Deptford under constant supply, and have applied for further instructions to make them all available in case of fire.

SHOREDITCH VESTRY.—At a meeting of the vestry on Tuesday last, a report was presented from the Sanitary Committee recommending—"That a notification be made to the Metropolitan Board of Works that it is desirable that a constant supply of water should be given to the houses within this parish, and it appearing that the water companies are willing to furnish such supplies upon being required to do so by the proper authority, the board be requested to make the necessary requirement to the companies in respect to such districts as the vestry may from time to time suggest." Mr. Turner, in moving the adoption of the report, dwelt upon the unsatisfactory way in which most of the houses in the parish were at the present time supplied with water. In some cases, he said, two or three families were supplied with water from dirty butts, holding perhaps only 36 gallons. Mr. Cranston seconded the motion, which was opposed by Mr. Cain, who remarked that he believed that the people were as anxious as the vestry to get pure water, and if they could not get it, the fault rested, not with the people, but with the vestry, who had the power to compel the landlords to provide proper butts and cisterns, without going to a higher authority, and incurring additional expense. He maintained that the present supply was sufficient for all practical purposes. Mr. Rooke expressed his opinion that it would be perfectly useless sending this resolution up to the Metropolitan Board of Works, inasmuch as that authority had already resolved that, having regard to the imperfect state of the law upon this question, they would not at present take any steps with a view of giving notice for a constant supply of water in any portion of the metropolis. Mr. Fell said that, no doubt, after what had been stated by Mr. Rooke, it would be no use adopting the report which had been just brought up; but he would strongly urge upon the Sanitary Committee the necessity of doing all in their power to compel the landlords to provide proper butts for the houses in the parish not provided with a constant supply. Mr. Turner having replied, the vestry divided, when there appeared—For the motion, 15; against, 34. The motion was therefore lost.

SANITARY SCIENCE

AS APPLIED TO TOWNS AND RURAL DISTRICTS, WITH SPECIAL REFERENCE TO THE DUTIES OF SANITARY AUTHORITIES IN SMALL TOWNS AND VILLAGES.

[Extracts from a Paper by J. BAILEY DENTON, Esq., C.E.]

Before going into the details of what sanitary authorities of small towns and districts may be obliged to do in the way of sanitary works, I think it should be quite understood that the duties of all sanitary authorities (which in large towns comprise many matters unknown in small ones) extend to the maintenance of pure air within and surrounding every dwelling, and to the provision of pure water for their districts—or perhaps I ought to say the condemnation of impure water wherever its use may be injurious to health within their district, and compel the provision of pure water by the owners of all dwellings.

Water takes precedence of other requirements because it is not only wanted for drinking, cooking, or washing, but it serves as a vehicle for transporting from the dwelling much of the filth which collects there, and becomes thereby the principal means of polluting the air. It is optional with sanitary authorities whether or not they will take upon themselves to provide water.

Next to the supply of water is the riddance from dwellings and the premises surrounding them of sewage and putrescible matters corrupting the air, which is not confined to the excretal refuse of the closet and chamber, but comprises the liquid discharged from the scullery and the sink, which may otherwise become a source of as much nuisance as the refuse of the closet itself. Nor are dwellings only the source of putrescible refuse. Farmyards, butchers shops, slaughter-houses, cow-houses, and stabling all contribute it, and will all come under the supervision of the Local Sanitary Board. It is not optional but compulsory upon sanitary authorities to provide such sewers as may effectually cleanse and drain their districts of this refuse. They "may" supply water; they "must" provide public sewers.

A very important duty towards the acquisition and maintenance of pure air is that of preventing the overcrowding of dwellings, and securing the proper ventilation of the space that exists in them. Dr. Arnott laid it down as a fact that the quantity of air respired by an adult human being amounted to 300 cubic inches per minute—not quite the sixth of a foot, and that the total quantity of air directly or indirectly vitiated in a day amounted to 2880 cubic feet. According to another authority (Tredgold) the amount of air respired is more than double that mentioned by Arnott, viz., 800 cubic inches per minute, and the total quantity of air vitiated during the day 4320 cubic feet. There is a great difference between the two, and I quote the figures not as a distinct guide to the provision of space which sanitary authorities should see exists in dwellings within their district, but as indicating the importance given by sanitary authorities to the air space essential to health. In the model lodging-houses 550 cubic feet, and in the barrack dormitories of the army 500 cubic feet are given to each person. A great deal of good may be done by sanitary authorities in condemning the practice of parents sleeping in the same room as grown-up children of both sexes, while perhaps lodgers occupy the rooms the children should have. No bed-room used by adults should contain less than 400 cubic feet per person, nor when used for children less than 250 cubic feet for each child. Depend upon it there is no object better worth the attention of sanitary authorities than the accommodation provided by those mercenary speculating builders, who run up houses at the least cost, and demand the highest rents of the poorest people.

What more I have to say must now be devoted to the actual works for the provision of water, and for the discharge and disposal of sewage.

Both these descriptions of works may partake of a combined or separate character in relation to adjoining districts. In rural districts it will frequently occur that portions may be separated from the rest of the union, and constituted an urban district, or placed under the local control of a parochial committee. This is a point which will, doubtless, be dealt with by the Local Government Board, and facilities for dividing unions by the Act of Parliament given before long. At present objections are constantly taken to the limits of jurisdiction, and to the exercise of controlling powers on the part of the Poor Law Guardians. The combination of authorities and the union of districts may be very advantageously carried into effect in certain instances, particularly where the watershed forms, as it mostly does, a better boundary than that of the union.

Addressing myself to the supply of water to small towns and villages, I believe I may say that the idea that once prevailed that villagers are generally plentifully supplied with water has given place to a knowledge that the contrary is frequently the case, and that while large towns are supplied from some common source in quantities varying from 10 to 50 gallons a head daily, at the moderate cost of 1s. to 2s. per 1000 gallons, delivered to the upper floors of houses, many villages are without a bare sufficiency, and have in dry years to pay 20 times as much for water brought by hand to the cottage door. I do not wish to be understood to say that the majority of villages are in the plight I speak of, but I have no hesitation in declaring that a very great number of villages are in such a condition, and that in other cases where there is no lack of quantity, the quality is very bad. The water from wells, where raised from a comparatively shallow depth, though clear to the eye, is more frequently than not tainted with sewage, which has found its way into them from the privy cesspit, or from a faulty drain, or from the constant practice of throwing the slops of the house into the ashpit or on to the yard surface at the cottage door. This condition applies equally to public pumps as to private wells, and so long as sewers discharging liquid refuse from dwellings are not water-tight, all wells in their vicinity, whether public or private ones, must be condemned as sources of supply. All this is bad enough, but when in default of wells the required water is obtained during summer and autumn from ponds and watercourses in the neighbourhood, the quality is even worse. The water is disgusting both to taste and sight, though necessity compels its use. In place of such supplies as these, surface and roof water stored in underground tanks, which, being made water-tight to hold the collected water, will, as a matter of course, keep out all defiling liquid, is a vast improvement, and the use of concrete, as it becomes better and more generally understood, will facilitate the adoption of such receptacles, and will go far to encourage the owners of houses to furnish a supply of water to their tenants. Under favourable circumstances concrete tanks to hold from 10,000 to 15,000 gallons may be constructed for about 28s. or 29s. per 1000 gallons, and this would involve a comparatively light charge upon the householders supplied. It would frequently happen, where there exist legal powers to carry out the arrangement, that water might be stored on landed properties adjacent to villages for the supply of the inhabitants. The landowners in such cases might become contractors, and supply the water at a price sufficient to repay themselves the cost. They would borrow the money as for other permanent improvements, if necessary, and charge their estates with its repayment within a given number of years. This could be done, did power exist, with the same simplicity that now attends the borrowing of money for draining and building. When giving evidence before the committee of the House of Lords on the improvement of land, last session, I made this suggestion, and, judging from the circumstance that the committee thought it of sufficient importance to mention it in its report, I have hopes that the suggestion will bear

fruit. To do so, however, legislative provisions will have to be required, first to enable landowners to execute such works and charge the villages benefited by the supply with the cost, and next to empower sanitary authorities to contract with landowners for the supply, and make the village communities liable for the payment of the charge for the term of years decided upon.

I have so frequently written and spoken on the subject of storing the excessive rainfall of winter for use in dry summers, that I do not desire to encroach upon your time at the present moment more than to declare my conviction that when once the necessity of storeage is acknowledged, the capability will be found without difficulty. It is quite certain that the expense of collecting water has been much exaggerated, particularly in those cases where a supply may be found by the collection of under-drainage water. I know of many instances in which the water of under-drainage may be collected at a sufficiently high level to serve villages, now devoid of a good supply, at a very trifling cost, compared with the advantages that would be gained. An annual rate of from 1s. to 2s. in the pound, on the rateable value—say 5s. a cottage—would, in many cases, repay the cost in 30 years. Where there is a copious supply, and it can be readily delivered, it is unnecessary to restrict the quantity. Twenty gallons per head per diem will then probably represent the quantity provided, unless there be public purposes to appropriate a part, when perhaps more will be wanted. When scarcity is to be dreaded, the maximum quantity that need be delivered may be taken at 10 gallons a head per diem; the minimum 5 gallons a head. In cases where storeage is resorted to, the quantity should not be less than 10 gallons a head per diem for six months in the year, with 50 per cent. added for evaporation and waste; and I need not tell you that the deeper the reservoir the better will be the quality of the water.

The treatment of small towns and villages for sewerage is a very difficult matter, and one which will always require careful consideration, particularly in cases where the water supply is obtained from wells, which can only be continued in use by being preserved from pollution. A faulty sewer is no better than a faulty cesspit. The sewage leaks out of both into the surrounding ground, and percolates through the soil into the wells, and although the soil may perform its functions in oxidizing the putrescible matter at certain times, and under certain conditions, it fails to do so at all times. With a water-tight pipe sewer to receive and discharge all excretal and slop refuse, wells may still continue to be used, and the same may be said where the excretal refuse is disposed of by the earth-closet system, and the slop refuse of the house conducted safely away by a water-tight sewer, but inasmuch as it is cheaper to have one system than two, it is not likely that both will often exist together. Moreover the earth-closet system invariably fails where it is left to individual management, though it may be successfully adopted where the sanitary authority constitutes itself the scavenger, and supplies the dry earth, and removes it after use. Where the water supply is obtained from other sources than neighbouring wells, the dry earth-closet system can be used for the excretal matter, and a simple contrivance, called the "syphon sewage-tank," used for the liquid refuse of the scullery and the chamber. The liquid in that case passes from the sink through the house wall into a small covered tank, the outlet from which consists of a syphon so arranged that it will not discharge any sewage until the liquid in the tank rises above the top of the syphon, when it at once becomes charged, and empties the tank very rapidly. As soon as the sewage is lowered to the level of the bottom of the syphon (which is a short distance above the bottom of the tank, so as to leave a space for the deposit to be cleared out periodically), the syphon is thrown out of action, and allows the tank gradually to fill again with sewage. The syphon discharges through a small well into a drain leading to certain sub-irrigation drains, consisting of common 2-inch agricultural drain-pipes laid about 12 inches below the surface of the cottage gardens. The sewage flows out of the joints of the pipes into the soil, which is deeply underdrained, and is thus utilized and purified. This arrangement was devised by my friend Mr. Rogers Field, and has been in successful action for about five years. I understand arrangements are now being made to have the apparatus constructed complete in earthenware, which will bring its cost within the reach of owners of cottage property. With an independent supply of water, and such an arrangement for the treatment of the refuse of dwellings, no pipe sewage need be adopted, and there will be no arrangement necessary for the disposal of the collected liquid sewage of the village, as none will exist. But wherever either the water used in small towns and villages is obtained from private wells, or the liquid refuse from either closet and house cannot be safely disposed of by the individual residents, there is no doubt that it is cheaper and better to make a clearance of the whole by systematic sewerage than by any other means. One great drawback, however, to the adoption of this complete treatment is that periodical flushings of the sewers are indispensable, and that in dry seasons it is almost impossible to obtain the required quantity of water unless special arrangements for storeage are adopted; and this would increase the cost materially.

I should be glad to have afforded some clue to the expense of sewerage and flushing arrangements, but as all towns and villages differ, it would only mislead to give an example.

With a plentiful and ready supply of water, a good fall, and a capability of delivering the sewage on to the surface of land by simple gravitation, it is not possible to suggest any better treatment than one complete system of sewers collecting the liquid from every occupation, and discharging it on to land at a sufficient distance away to be free from all idea of nuisance, where, by proper treatment, it can at once be purified up to the standards to which I have referred, and profitably utilized into the bargain before ultimate discharge.

This brings me to the very important and concluding part of my subject—the disposal of the sewage of small towns and villages.

In every rural district there is a certain proportion of the poorer inhabitants who would be advantaged by the possession of garden allotments, and I can conceive no better mode of dealing with the sewage than by enabling these persons to participate in any benefit to be derived from it. The only arrangement necessary to effect this is the laying out, below the level of the sewer mouth, of a certain quantity of land which may be used as gardens to receive the sewage. In towns where the population is counted by thousands, it will be a question whether the sewage should not be applied to as broad an area of land as possible, irrespective of such considerations. In any case it will be desirable to adopt the principle of intermittent filtration, wholly or in connexion with irrigation, as a means of securing the required purification. I should explain that irrigation is defined as the running of foul sewage over as many acres of land as will completely wet it without supersaturation, having in view the maximum produce of vegetation from the quantity supplied. Intermittent filtration, on the contrary, is the concentration of sewage on as small an area of land as will absorb and cleanse it up to the recognized standards by its passage through the soil, vegetation participating in the sewage on the surface with prolific result at the same time. When properly managed, no sewage in either case passes directly off the surface into the open watercourses; what plant growth does not appropriate passes through the soil, and by the admission of air in the interim between application the infiltrated putrescible ingredients are oxidized, and rendered harmless. This result being gained without any help of man beyond the mere distribution of the sewage on the surface, is free from that uncertainty which attends manipulation. Of course, in the case of irrigation it is desirable not to over-dose the land, while in the case of intermittent filtration it is absolutely necessary to apportion to a given bulk of soil a given quantity of sewage. It is by these means that purification is secured. In clay lands which crack in the summer season, it is sometimes necessary to reapply the effluent—that is, having run it through a certain depth of soil and discharged it by under-drains, it is run through a second depth of soil to bring the effluent up to the standards. The Rivers Pollution Commissioners, in their report of the 29th of June, 1872, after having most carefully examined both means of application to land, state that two processes of sewage purification by the use of land are now open for adoption by towns, both having been sufficiently tried on a working scale, the first being sewage irrigation which has been practised at Edinburgh and other places for many years, and the other intermittent downward filtration as carried out at Merthyr Tydfil, which has now stood the test of about three years. Upon the efficiency of the latter process, I will read to you a translation of a letter I received from the late Baron Justus von Liebig, a short time before his death. He says:

Sir,—Receive my best thanks for your letter of the 3rd inst., and for the paper on "Intermittent Filtration through Natural Soil." I have read this with great pleasure and real satisfaction. You have utilized in the most effective way, for the service of populations, the natural law which I laid down in my book, the "Natural Laws of Husbandry," pp. 113 and 114. Your plan for the purification of liquid sewage and the removal of its injurious effects, as well as the technical execution of the plan, and the use of sewage as manure, are alike excellent, and I only wish that use may be made of it in other places. In Silesia for some years past the best use has been made of your principles, in the beetroot sugar manufactory of Herr von Rath. In the neighbourhood where this manufactory is situated there is a want of spring water and of water generally, and this want has called forth the following arrangement. All water that has been used in the manufactory, and generally all waste or foul liquids, are discharged on to a well-drained piece of land close at hand, and the filtered effluent water is collected in a well. It is pure and clear and it is again raised, by a pump and used in the manufactory as fresh water. Enormous crops of grass are obtained from the piece of land which serves for filtration.

With the greatest respect, believe me, yours truly,
(Signed) J. von Liebig.

Irrigation should always be connected with intermittent filtration by preparing a part of the land specially for the latter purpose. By this means the objections hitherto raised to irrigation are removed. If a farmer is told that he must take and dispose of any quantity of diluted sewage that may be discharged from town at all times, and under all circumstances—"in wet weather and in dry weather, in winter and in summer, at night as well as in the daytime, and when the land is in crop as well as when it is in fallow"—he will decline the task as one of insuperable difficulty. The plan I now recommend and adopt is based on the following data:—An acre of land will fully utilize the sewage of 100 persons on the principle of irrigation, while the same area of land is sufficient to purify the sewage of 1000 persons if it be passed through the soil intermittently. Ten acres of irrigation therefore correspond with one acre of filtering ground. Accordingly I have advised that wherever land can be obtained at a reasonable price, and the sanitary authorities of a town are desirous of utilizing the sewage—and it would be sinful to waste if it can be profitably applied—they should purchase one acre of land for every 100 of the population, and that one-tenth of that quantity should be set apart, and properly prepared for filtration. This one-tenth would be prepared to receive the sewage when not required on the remaining nine-tenths. The latter would then find customers at a high rent, because they would be at liberty to take just as much sewage as they liked, and no more, and only when it suited them to take it.

This describes the operation where intermittent filtration and surface irrigation are worked together in order to make the latter process profitable. Where intermittent filtration is adopted *per se*, my plan is this:—First, instead of using one area sufficient in extent to purify the sewage according to the examples given by Dr. Frankland, whose published views first led me to adopt the process at Merthyr, I prepare three areas of an equal extent, each capable of cleansing the sewage, and by special treatment made capable also of growing crops at the same time; and, second, I arrange that each area shall be used for purification for one year only at a time, so that two out of the three may be devoted to plant growth. Thus I obtain from the two series not in use for filtration, and which take only just as much sewage as would produce the most abundant yield they are capable of producing, the best return.

Now as all places—small towns and villages—will be able to adopt one or other of these processes, the wide surface irrigation of 1 acre to 100 people, or intermittent filtration requiring only 1 acre to 1000 people—or any intermediate course between the two—they will be able to "cut their coats according to their cloth," and there ought to be no hesitation on the part of the sanitary authorities in so disposing of their sewage, instead of allowing it to pollute our watercourses, particularly where it can be applied to land to be used as gardens for the labouring portion of the population.

There has always been one practical difficulty, however, in dealing with the sewage of small populations. The outflow is very irregular. It is diminished at certain periods of the day to a dribble, while at other times there is a copious discharge. It was essential, when applying the sewage of small towns, to overcome this drawback, in order that the land might receive only the quantity which it was capable of purifying. It therefore became necessary to devise a means of regulating the sewage to be dealt with, and the contrivance which has now stood the test of two years experience, and which is called the "Self-Acting Sewage Regulator," peforms the service in the most simple manner. It has the great advantage of acting equally well during the night as during the day, and without supervision at any time. The sewage from the town or village is discharged into a tank of such capacity, that when the liquid rises to a given level the tank holds the precise quantity it is desired to deliver to a certain area of land at a time. This tank is provided with a syphon outlet, which is brought into action as soon as the liquid rises to a given level. When this is reached the tank discharges itself through the syphon, and continues flowing until the level of the liquid has fallen down to the inlet mouth of the syphon, when air is drawn into the syphon, and the discharge ceases. The sewage then collects again, slowly or quickly as the case may be, until the tank is full, when the automatic action comes into action, and the liquid is applied to the same or to other land. Intermittency of action is thus secured in the most simple and effective way. Arrangements exist in the tank for intercepting the coarser matters, and precipitating the finer particles. This contrivance has now been at work for two years without failure, and its success will help in no small measure to solve the sewage problem in the cases of small towns and villages.

Regulation of the Volume of Gas during its Passage to the Burner.—At a recent sitting of the Academy of Sciences, Paris, M. Jamin presented, in the name of M. Giroud, a description of a new gas-regulator for the purpose of obtaining a constant volume of gas for combustion. After referring to the history of the attempts which had been made to obtain an equalized supply for industrial or laboratory purposes by Clegg, Thénard, Bunsen, and others, he stated the difficulties that had to be encountered, and remarked that his object was to render the volume of gas which escapes, at any point, during its passage in a pipe, independent of variations in the pressure, and also of the size (area) of the orifice whence it escaped for combustion. For this purpose he has invented an instrument, which he calls a *rheometer*. This instrument is of small size, and consists of a cylinder of 3½ centimètres in diameter (1⅜th in.), with the same height. In the interior is a bell-shaped vessel, which is weighted. The gas passes into the vessel, raises it, and then rises before passing out. Whatever may be the pressure, it is evident that the difference between the in and outside pressure remains constant, since the weight of the bell vessel remains constant. Now, the difference of pressure regulates the volume which escapes, and consequently the volume which escapes must be constant. M. Giroud can thus regulate the volume consumed, independent of the burner; it is the pressure alone that effects the constancy of result. The apparatus has been successfully applied in laboratories for gas-lamps, and appears capable of other and more extended uses.

ATMOSPHERIC DUST.

By M. G. TISSANDER.

An extract from a paper by M. Tissander gives the following:—

1. *Analysis of Particles of Dust suspended in Atmospheric Air.*—The following results of analysis were obtained in reference to the weight of dust corpuscles contained in one cubic mètre of air at Paris:—

After Abundant Rain, July, 1870. Gramme.	After Eight Hours Dryness in Summer, July, 1872. Gramme.	Normal Condition of the Atmosphere, June to July, 1870, and April to November, 1872. Gramme.
0·000	0·000	0·0060
0·000	0·000	0·0075
0·006	0·023	0·0080

The quantity of solid matters contained in one cubic mètre of air at Paris varies, according to analyses, from 6 to 23 milligrammes.

2. *Dimensions of the Particles of Dust.*—When they result from wood and charcoal (as soot, &c.), they attain a length of one-tenth of a millimètre; when produced from mineral matters, such as silica, &c., their diameter varies from the 100th to the 1000th of a millimètre.

3. *Atmospheric Deposit.*—The dust particles remain suspended in the air only when the latter is in motion. The finer particles, of course, remain the longest in suspension, but eventually all fall as a deposit to the ground. At Paris there is an average weight of this deposit formed to the extent of 0·002 grammes in twelve hours on each square mètre of surface.

4. *Chemical Composition of Atmospheric Dust.*—This is as follows:—

Oganic matter burning with brilliancy	25 to 33
Mineral matter (cinders, &c.)	75 to 66
	100 to 99

We have found in the cinders, salts soluble in water, containing chlorine, sulphuric acid, with traces of nitric acid. We have almost always detected in the matters soluble in hydrochloric acid, the presence of iron. Chalk and siliceous matter are invariably present.

The analyses made on five grammes gave the following results:—

Organic Matter, very combustible, rich in carbon, burning brilliantly	32·265
Mineral Matters, soluble in Water—	
Alkaline chlorides and sulphates, alkaline earths, and nitrate of ammonia	9·220
Soluble in Hydrochloric Acid—	
Sesquioxide of iron	6·120
Carbonate of lime	15·940
Carbonate of magnesia, traces of phosphates, alumina, &c.	2·121
Insoluble in Hydrochloric Acid—	
Chiefly silica	34·334
	100·000

A great number of specimens, gathered in various localities, enabled us to determine the presence of most of the substances above named, and especially iron, which was always an important constituent.

Conclusion.—It appears, therefore, that the quantity of solid matter suspended in the air, or falling as a deposit, is sufficient to play an important part in the physical constitution of the earth. Our experiments show that atmospheric dust is composed of about one-third of organic combustible matter and two-thirds mineral. We especially insist on the presence of iron, which we have found in notable proportion in the specimens of dust that we have examined. We have long attributed to this metal a cosmical origin. After the researches of M. Nordenskiold we are safe in affirming that a portion of the floating particles of dust in the atmosphere is of planetary origin.—*Journal de l'Eclairage au Gaz.*

PEAT FUEL MACHINERY.

[A Paper read before the Institution of Civil Engineers on Tuesday, May 12, 1874, by Mr. JOSEPH M'CARTHY MEADOWS.]

This communication was directed to the consideration of points of difference in construction and arrangement in some examples of peat machinery which had been examined by the author. The mechanical systems in use were classified into the wet process for densifying, and the dry process for compressing peat. The wet process macerated or mixed the raw peat, and for that purpose mechanism of the pug-mill class was usually employed. Of existing machines those of Schlickeysen, Rahder, and Clayton were referred to. In the Schlickeysen, or chief German machine, the twofold work of mixing and of forcing out the peat as a pulp under a moderate pressure was effected by one operation of the arms or blades on the upright shaft of the mill; while in the Rahder, or Dutch machine, the mixing and forcing were separate operations. The upper part of the Rahder pug-mill contained the vertical shaft, the arms of which simply mixed the peat, while in the lower part the pulp was forced outwards, under a moderate pressure, by a short horizontal screw or spiral. The same twofold action to some extent characterized the Clayton machine, with this difference, that the action of the screw or spiral was principally relied on, in combination with fixed cutters in the inside of the casing, for a fine comminution of the peat. The author was, however, of opinion, that a rough effective mixing of the raw material was sufficient for making good dense peat, and that in practice mechanism for fine comminution was not desirable. The German and Dutch machines were stated to be capable of mixing and delivering, singly, about 60 tons of wet peat for each full working day, which quantity, when in usual air-dried state, would give from 14 to 15 tons of dense peat fuel; and practice had shown that a single machine, upon the pug-mill principle, could not be economically or usefully taxed to give any much larger production. The machine of Clayton had not yet been tested by working results of sufficient length spread over one or more full seasons, and accurate data as to its average capability of production were wanting. The proportion of water in peat was upon the average 80 per cent., and the treatment of 60 tons of raw peat in one machine in twelve hours would represent its mixing and delivery in the state of pulp at the rate of about 230 cubic feet per hour. Working arrangements were either fixed or transportable; of the latter kind the Rahder machine was instanced as a useful example. The author thought that the principle of transportability, by which the mechanism should constantly follow the excavation, was an essential requisite of commercial success where an extensive tract was to be worked. In the Rahder system the mills with their portable engines (each from 6 to 8-horse power) travelled on rails laid temporarily alongside the line of excavation, and were thus kept close to the raw material, which would otherwise, if the machinery were fixed, have to be moved with its 80 per cent. of useless water to the place of manufacture. The same principle of transportable mechanism was carried out in extensive peat works in Bohemia. Eichorn's system of making ball turf by the wet process was next described, specially with a view to illustrate the application of fixed lattice frames for drying the peat balls. For each Clayton machine 9000 wooden trays were stated to be necessary for the drying; and the systems of Eichorn and of Clayton in this respect represented two distinct modes of arrangement.

Mechanism for disintegrating raw peat by rollers or cylinders armed with teeth or points was next referred to. In some instances the functions of machines of this kind were simply confined to producing pulp from peat without delivering it in shape. The mass of pulp was in such cases spread on the drying-ground and divided into pieces by hand. Challeton's system, by which raw peat was reduced by copious addition of water into a thin fluid state, in which condition it flowed into shallow basins for filterage and partial drying, was next described, but the principle was not thought to be conducive to economic production. The extent of shallow reservoirs that would be requisite, and which, unless roofed over, would be available only for the few fine months of the year when peat could be made in the open air, did not constitute an improvement.

Exter's system for making compressed peat by the dry process was next detailed. The peat was obtained in a fine condition by a thin slicing of the surface of the bog, partly dried in the open air, and finally by artificial heat, and was then compressed by direct mechanical force, by iron rams or plungers, worked by steam power, from eccentrics.

In reference to the production of dense peat by the wet process, it was stated that on the Continent, in 1872, the cost varied from 6s. to 7s. per ton. With the present prices of labour in this country, the author thought the cost, when spread over a full year's expenses, could not be safely estimated at less than from 7s. to 8s. per ton. Economies might hereafter reduce the cost from 6s. 6d. to 7s. per ton, but not to less; and estimates based upon lower rates were, in the author's opinion, not reliable. As compared with an average of four varieties of German coal, the heating power of peat was stated to be about 60 per cent. that of coal. This result was arrived at in practice in Southern Germany, where peat was largely used for locomotive purposes, and in this respect, weight for weight, light fibrous peat gave as good a result as dense or compressed peat, the advantages of the latter consisting solely in the reduction of bulk and the concentration of the original quantity of peat in a smaller space. The economic worth of that reduction was, practically, the measure of the increased value given by mechanical systems to peat. The author thought that, in the vicinities of bogs where the use of peat in its ordinary condition of cut turf had been established, changes were not likely to be made in the regular mode of preparation for local purposes; but if markets could be profitably opened for peat fuel at a distance, the reduction of its bulk would become of importance. As dense peat made by any system of the wet process gave, when charred, a firm charcoal, which was not obtainable in compact condition to the same extent from peat simply cut and dried, the author thought, looking to the great stores of coal in Great Britain, it was in that direction most hope lay for the advantageous application of mechanical processes. He supported this view by stating that in most cases abroad the adoption of mechanical systems might be traced to necessities which had arisen either from inferior character or local circumstances in connexion with peat deposits there, which did not exist to the same extent in the deposits of peat of superior class which were found in these countries.

The paper closed with particulars of some laboratory tests, carefully conducted by Professor Galloway, of the Royal College of Science for Ireland, to ascertain the absolute heating power of peat. Three samples of dense peat made from the upper, the middle, and the lower portions of an Irish red bog, were used—each being in the best possible air-dried state. No. 1, from the upper fibrous portion of the bog, had a specific gravity of 0·637, weighed 39·81 lbs. to the solid cubic foot, and gave an absolute heating power, by Thompson's instrument, equal to 6·05 lbs. of water at 212° Fahr., converted into steam by 1 lb. Sample No. 2, from the middle of the same bog, had a specific gravity of 1·000, weighed 62·50 lbs. to the solid cubic foot, and gave an absolute heating power equal to 5·50 lbs. of water at 212° Fahr. converted into steam by 1 lb. Sample No. 3, made from the lower portion of the same bog, had a specific gravity of 1·173, weighed 73·31 lbs. to the solid cubic foot, and gave an absolute heating power equal to 6·33 lbs. of water at 212° Fahr. converted into steam by 1 lb. Although differing in relative densities, the heating powers in respect of equal weights did not materially vary. When compared, however, in respect of their relative bulks, a cubic foot of No. 1 peat would be found to give an absolute heating power equal to the conversion of 240·87 lbs. of water at 212° Fahr. into steam; while Nos. 2 and 3 would give respectively 343·75 lbs. and 464·07 lbs. of water converted in like manner into steam, from 212° Fahr., for one cubic foot of each.

THE ACTION OF CERTAIN SALTS, IN ORDINARY WATER SUPPLY, ON LEAD.

In our issues of Feb. 10 and April 28, we published abstracts of reports presented to the Academy of Sciences of Paris on the action of water on lead, and on the detection of that metal in a state of solution. The following is an abstract of a paper by M. Fordos, recently presented to the Academy. He remarks:—

"All the phenomena which are noticed in studying the action of water on lead are easily explained, if it be admitted, in the first instance, that the cause arises from the formation of oxide of lead in the presence of water containing atmospheric air, whether that be distilled water, or such as is used in the ordinary domestic supply. The difference of results obtained by analysis, however, materially depends on the chemical contents of such waters.

"In distilled water, the oxide of lead formed is found in the liquid in the form of the hydrate, having a dusky white colour, until it meets with the carbonic acid of the atmosphere, when it becomes precipitated as a carbonate. In drinking waters which contain much chalk, the oxide of lead combines with an equivalent of carbonic acid, of the bicarbonate of lime, whence result the carbonates of lead and lime, the latter being precipitated. The carbonate of lead being an insoluble salt, the water can only retain in solution an infinitesimal portion of it. It is to the presence of bicarbonate of lime that he attributes the almost absolute absence of lead in solution in drinking water circulating in leaden pipes, which, from its constant passage, has no rest. Carbonate of magnesia seems to have a similar action to that of carbonate of lime."

The author next proceeds to investigate the effect of other saline ingredients of drinking waters such as sulphates, chlorides, and nitrates, and to determine this point he entered on the following experiments:—

When a solution of sulphate of soda was agitated with lead in a fine state of division in the presence of air, speedy results followed. A white precipitate, composed of carbonate and sulphate of lead, was produced. The water gave an alkaline reaction with turmeric paper, and was slightly coloured when sulphuretted hydrogen was passed through it, indications which proved the presence of lead in solution. This result the author explains by presuming that the oxide of lead acted on the sulphate of soda, producing sulphate of lead and free soda; this, in the presence of atmospheric air, becomes converted into carbonate of soda, and reacting subsequently on the sulphate of lead, results in the production of carbonate of lead and sulphate of soda. A series of reactions consequently render the lead soluble to the alkaline soda.

With a solution of chloride of sodium (common salt) M. Fordos obtained an alkaline liquor, containing a small quantity of lead in solution, with precipitate of carbonate and chloride of lead. With nitrate of potash he had analogous results—namely, a precipitate of carbonate of lead, of the basic nitrate, and probably of the pentabasic nitrate, the reaction indicated only minute traces of nitric acid. With nitrate of ammonia the precipitate was not easily formed, and much difficulty was found in collecting it as it passed freely through the filters. Free ammonia was found in the liquid, which was also coloured by sulphuretted hydrogen. The precipitate consisted of carbonate, or oxy-carbonate, of lead, with only traces of sub-nitrate of the metal and nitric acid.

A saturated solution of sulphate of lime had a very slow action on lead, but similar results were obtained to those already mentioned—namely, an alkaline liquid, which became coloured by sulphuretted hydrogen. The precipitate consisted of sulphate of lead, the carbonate, and carbonate of lime. By mixing a little chloride of sodium with sulphate of lime, the action on lead was decidedly increased, the chloride probably aiding the solution of the sulphate of lead, as had already been shown by M. Mialhe.

In applying these and other facts to the question of the action of water on

lead in leaden pipes, M. Fordos comes to the conclusion that ordinary drinking water, allowed to remain a long time at rest in such pipes, must become impregnated with the metal to a more or less injurious degree by the lead dissolved, and its salts held in suspension. This was evidently proved by allowing water to rest for various periods undisturbed in leaden pipes, when traces of lead were always discovered. Finally, the author recommends that in all cases water conveyed in leaden pipes should be filtered before domestic use, while that which has remained long in the pipes should be rejected as possibly harmful.

IRON AND COAL TRADES OF SHEFFIELD, SOUTH YORKSHIRE, AND NORTH DERBYSHIRE.

(FROM OUR OWN CORRESPONDENT.)

Trade is still very dull in most departments, but in many instances manufacturers, founders, and other employers are finding their men as much work as possible this week by way of a set-off against the idle week which will next ensue as a necessary consequence of the Whitsuntide holidays—the foremost of the year in this district.

Raw materials are not much altered in price. Cleveland pig iron is firm at about these prices:—No. 1 foundry, 77s. 6d.; No. 2 foundry, 70s.; No. 3 foundry, 67s. 6d.; No. 4 foundry, 63s. 6d.; No. 4 forge grey, 61s.; mottled, 60s.; white, 56s.; and cinder, 50s. per ton; net cash. Scotch pig, now hardly obtainable for local use, is scarce and nominally dearer, owing to the limited production consequent upon the small number of furnaces in blast. West Yorkshire, and Leeds pig iron is firm at recent prices, which are, nominally—No. 1, £4 5s.; No. 2, £4 2s. 6d., and No. 3, £4; all of which figures are subject to special negotiations.

In Derbyshire the founders are quite as well employed as when last alluded to. The Sheffield steel trade is very dull indeed, and prospects are by no means of the brightest. Most of the establishments in this branch will close from Saturday to Thursday next, or to the following Monday. The Parkgate Iron Company's annual report is of a very favourable nature indeed. The year's profit is £39,902 (less £14,950 paid as an interim dividend of £5 per share on December 1st last), out of which a dividend of £15 per share is recommended to be paid.

Pending the definite settlement of the amount of reduction in their wages to be submitted to, the miners, numbering some 1500, employed at the Wombwell Main Colliery, the Lundhill Colliery, the Manvers Main, and Darfield Main Collieries struck work on Thursday; but the Lundhill men had the good sense to resume operations on Friday. The whole proceeding is condemned by the Miners Association. The men will in all probability finally decide to accept a drop of 10 per cent. in their wages.

The Wakefield Water Bill is meeting with the most strenuous opposition of the corporations, millowners, &c., of Sheffield, Rotherham, and other towns.

At the Swinsty reservoir about 29,000 cubic yards of puddle have recently been put into the puddle trench. The tunnel has been finished and the valve-shaft built to a height of 64½ feet above the invert. The main embankment has been raised to within about 45 feet of the top, or 39 feet of the water-line. Part of the bye-wash has been excavated and built in with masonry. The total sum so far expended on this reservoir is £94,802. Next week we purpose to allude to the more important new works of the Leeds Corporation.

THE NORTHERN COAL TRADE.

(FROM OUR OWN CORRESPONDENT.)

With the exception of three collieries in the Hartlepool district, where the men obstinately held out, the Durham collieries were at full work last week. As the shipment of gas coals had been kept back by the colliers strike, there was considerable activity at the Tyne Dock and other shipping places, and more coals were put on board sailing ships and steamers within the week than upon any week during the past three months. As the coals from the leading gas collieries in Durham are mostly contracted for, they are not materially affected by the changes in the open market. The same observation applies to first-class steam coals; but all sorts of second-class coals, notwithstanding little work had been done in the Durham coal-field for a fortnight, were rather weaker than otherwise in price, and without a strong demand. On account of the Whitsuntide holidays, there will not be much done at the pits until Wednesday in this week. This circumstance, with the extra shipments of coals, in consequence of detentions through the late strike of the pitmen, will prevent any violent downward reaction by the falling off in the demand from the Cleveland district at present. In a short time, however, if the iron miners strike is not settled, it will, without doubt, be very considerable. The principal iron-works have not yet wrought off their stocks of ironstone, and have been kept very well employed. When these supplies cease and the demand for shipment is filled up, the Durham coal trade will collapse very materially if the obstinate strike of the iron miners goes on.

The Tyne and other northern coal ports were very bare of shipping last week. This arose from two causes—the winds were contrary, and the disturbance in the coal trade of the previous fortnight had driven shipping to seek freights at other parts of the coast. Freights were, therefore, generally higher, and but for the abundance of steam tonnage it would have been impossible to have got the coals away.

The dispute in the chemical trade got settled last week, and the factories were at work. No more business has come to hand in consequence, and this extensive north country industry is very depressed. There are no immediate prospects of a settlement with the ironstone miners of Cleveland. Of course, there is great anxiety in the trade; but as the iron trade of the country shows few signs of revival, the disturbance in Cleveland does not materially affect prices.

DUMBARTON GAS AND WATER SUPPLY.—The Town Council of this flourishing old burgh have their hands pretty nearly full with improvements and new works. Having taken over the gas-works, and obtained an Order in Council to enable them to re-causeway the High Street, they have, before doing so, taken the wise precaution of relaying the streets with larger-sized gas-pipes and new water-mains on both sides, so as not to disturb the causeway in making future connexions. They also intend to widen the footpaths on each side of the street to 9 feet.

WINDSOR SEWERAGE.—For a considerable time the sanitary authority of Windsor has endeavoured to meet the requirements of the Thames Conservancy Board for the purification of the town sewage, but up to the present moment its efforts have been unavailing. The Windsor Local Board has now under its consideration the design of Mr. Hamilton Fulton, C.E., which, it was alleged, if carried out, would have the effect of purifying the portion of the Thames valley lying between Eton and Barnes. To accomplish this it is proposed to construct a main line of sewer from Windsor to the Thames, below Dartford Creek, in a nearly direct route, *viâ* Staines, Ashford, Kingston, Rayne's Park, near Wimbledon, Mitcham, Selhurst, Croydon, South Norwood, Beckenham, Bromley, Chislehurst, The Crays, Bexley, Dartford, &c. It is proposed to separate the rain water from the sewage, and, therefore, the average size of the sewer need not exceed, between Windsor and near Kingston, 2 feet in diameter. It is intended to irrigate a tract of land below Dartford Creek, adjoining the river, and a considerable distance from any town or village. Between Kingston and Dartford Creek the districts are becoming rapidly built over, so that the main sewer before referred to would be made subservient to the use of those localities, all of which are beyond the limits of the system of sewerage of the Metropolitan Board of Works. In order to overcome the summit of the country near Selhurst, it is proposed to have three lifts, up which the sewage would be pumped by steam power. Referring to the above paragraph, a correspondent of *The Times* states that there is no design by Mr. Hamilton Fulton, the engineer, under the consideration of the Windsor Local Board. That body, so far from proposing to adopt the separate or duplicated system, has, by resolution, repudiated it. The only scheme under the consideration of the sanitary authority of the borough for the disposal of the sewage is that propounded by Mr. Hawksley, C.E. On Saturday last was concluded an inquiry into the merits of this plan, held at the town-hall, before Mr. Rawlinson, the eminent engineer, on behalf of the Local Government Board. His report will soon be published.

Register of New Patents.

2834.—MAITLAND, W. H., St. Swithin's Lane, London, "*Improvements in the manufacture of gas, and in apparatus employed therein.*" A communication. Patent dated, Aug. 28, 1873.

This invention relates to the production of illuminating gas of high candle power from liquid hydrocarbons, combined by a peculiar process with atmospheric air, or with gas of low candle power, derived from the distillation of certain inferior qualities of coal, or with other suitable gaseous or aëriform matter, and consists in a process or method of making illuminating gas by passing atmospheric air through or in contact with a volatile hydrocarbon until saturated therewith, and then subjecting in a suitable retort the air and hydrocarbon vapour thus combined to a heat sufficient to convert the whole into a permanent or fixed gas. The invention also comprises the production of illuminating gas by the use, in lieu of light hydrocarbons as aforesaid, of heavy or crude petroleum, there being in this modification of the invention provision made for subjecting the heavier portions of the petroleum to destructive distillation simultaneously with the treatment by heat of the vapour-charged air drawn through or from the petroleum to the retort. The invention also includes the enrichment of illuminating gas (made by ordinary methods, but from inferior materials, and hence by itself practically worthless for illumination) by treating the same in connexion with light or heavy liquid hydrocarbons. The invention also embraces an apparatus for carrying into effect the aforesaid process in each of the several modifications thereof.

2840.—JOHNSON, J. H., Lincoln's Inn Fields, "*Improvements in apparatus for generating hydrogen or carburetted hydrogen gas, and in the means for evaporating the dilute acid employed in generating the gas.*" A communication. Provisional protection only obtained. Dated Aug. 28, 1873.

This invention consists of a peculiar apparatus in which hydrogen or carburetted hydrogen gas can be generated uninterruptedly to an extent commensurate with the demands, and in which the spent dilute acid used in generating the gas can be evaporated for the purpose of crystallizing and recovering the sulphate of iron held in solution.

2842.—WALSH, W. J., Birmingham, "*Improvements in gas and other lamps.*" Patent dated Aug. 28, 1873.

These improvements in gas chandeliers or gaseliers consist in dispensing with the ordinary slides, and substituting therefor jointed tubular links, through which the gas passes, the links being so jointed together and to the moveable body and fixed or ceiling part of the chandelier, as to be capable of folding up to allow the body of the chandelier to be raised or lowered to the desired height.

2856.—TYSOE, C., Salford, Lancs, "*Improvements in means for supplying tar, oil, creasote, spirit, or other ignitable fluid or fatty matter to furnaces, and for promoting the combustion of such matters.*" Patent dated Aug. 30, 1873.

According to these improvements oil, tar, spirit, creasote, tallow, lard, or other like matter is injected into boiler-furnaces by means of jets of compressed air, and fire-clay lumps, chalk, pumice-stone, or scrap-iron is employed as a heat-retaining medium. The matters are sometimes injected through hollow fire-bars.

2889.—GREEN, H., Preston, Lancs, and BARROW, J., West Gorton, near Manchester, "*Improvements in effecting the ignition of gas, and apparatus and means for opening the supply of gas to burners, for igniting the gas, and for extinguishing gaslights.*" Patent dated Sept. 2, 1873.

According to this invention, to each lamp or burner is applied a small collapsible vessel or chamber connected and arranged to actuate a suitable lever or tumbler carrying a cup or vessel of mercury or other suitable sealing liquid to effect the opening and closing as required of a nozzle or orifice for supplying gas to the burner, and in order to obviate the difficulties arising from the variations in pressure usual in mains, this vessel is arranged not to expand or open out until subjected to a higher pressure than the maximum ordinary pressure in the mains, but when the pressure is increased beyond that, the lever or tumbler is caused to unseal the nozzle or orifice communicating with the burner, at the same time actuating suitable apparatus for effecting the ignition of the gas, after which the vessel partly collapses, but is arrested at the proper time, retained and securely held in the proper position for keeping open the nozzle or orifice leading to the burner until the extra pressure is again put on, whereupon the vessel or its moving part or parts is or are again expanded or caused to move outward, and act upon a mechanical device so that when the extra pressure is again taken off the holder is left free to collapse or close up, thereby extinguishing the light.

The invention further consists in effecting the ignition of the gas by bringing together through the operation of the gas pressure or otherwise suitable chemicals, which by their action on meeting shall produce the requisite flame, or spontaneously inflammable gas, for igniting the gas. In some cases the cup or vessel of mercury or other sealing liquid above mentioned may be arranged to effect the opening and closing as required of two nozzles or orifices, one supplying gas to the burner, and the other to a separate orifice or orifices provided with a uniting chamber for igniting the gas by chemical means, thereby producing a separate gas-flame for effecting the ignition of the gas issuing from the main burner.

The apparatus for governing the opening and closing of the orifice or orifices for the gas, as well as the parts of the invention which relate to effecting the ignition by chemical agents, besides being used in conjunction with each other, may respectively be used, in some cases apart from each other, in connexion with other arrangements or apparatus for effecting the opening of the gas supply, the ignition of gas, and the extinction of gaslights.

2936.—BOIS, L., Paris, "*Improvements in the manufacture of lighting gas and in apparatus employed therein.*" Patent dated Sept. 6, 1873.

This method of manufacturing illuminating gas consists in a new process and a special apparatus. The process consists in causing the steam of water to circulate through a series of cast-iron tubes heated to redness, and containing little pieces of scrap or waste iron in order to commence the decomposition of the steam, the oxygen from which unites partly with the iron, and in then immediately leading the steam into a second series of tubes made of fire-clay also heated to redness, and containing salts of soda or carbonate of soda, which unite with the remaining oxygen, and thus completely isolate the hydrogen which is now set free. The hydrogen is then led into a refrigerator or cooler, serpentine or worm-shaped, from which it passes into a gasometer, but to render this gas suitable for lighting purposes, it is placed in contact with carburetted spirit, when a gas of great brilliancy, steadiness, and power is obtained.

APPLICATIONS FOR LETTERS PATENT.

1732.—Underhay, F. G., Clerkenwell, Middlesex, "Improvements in apparatus for drawing off water to prevent or reduce waste." May 15, 1874.
1733.—Pontifex, E. A., Shoe Lane, London, "Improvements in apparatus to be used in drawing off water." May 15, 1874.
1764.—Kidd, J. H., Wrexham, "Improvements in the preparation and application of certain materials for deodorizing sewage and like matters, and in the manufacture of artificial manures." May 19, 1874.
1765.—Bennett, C., Islington, Middlesex, "Improvements in lamps." May 19, 1874.
1787.—Darwin, S. B., Shrewsbury, "Improvements in the method of lining or coating iron pipes." May 20, 1874.
1799.—Alexander, E. P., Southampton Buildings, London, "Improvements in liquid-meters." A communication. May 21, 1874.

GRANTS OF PROVISIONAL PROTECTION.

1609.—Bond, Dr. F. T., Gloucester, "Improvements in filtering and purifying water and other liquids, and in apparatus therefor." April 30, 1874.
1619.—Frost, H., Manchester, "Improvements in fluid-meters, applicable also to apparatus for obtaining motive power and for pumps." May 7, 1874.
1629.—Kaulbach, E., Bedford Square, London, "An improvement in the means of and apparatus for raising and lowering gaseliers and chandeliers, the same being applicable also for other purposes." May 8, 1874.
1652.—Butterworth, E., Manchester, "Improvements in air and gas engines." May 9, 1874.
1670.—Stuart, J. M., Queen Victoria Street, London, "Improvements in gaseliers and in glass shades or globes for gas-burners." A communication. May 11, 1874.
1689.—Alsing, G., Preston, "Improvements in the manufacture of an artificial fuel from sewage deposits, nightsoil, and other dry and moist manurial matters mixed with other materials." May 12, 1874.
1698.—Warner, W. J., South Shields, and Cowan, W., Edinburgh, "Improvements in gas-meters." May 13, 1874.

NOTICES TO PROCEED.

77.—Fottrell, J., Dublin, Ireland, "Improvements in artificial stone pipes and tubes, and in the coating or lining thereof, to render them suitable for the conduct of alkaline liquids and acid products from gas-works, for sewage, saline liquids, and gas." Jan. 7, 1874.
128.—Woodward, J., Darlington, "Improvements applicable for the manufacture of pipes and tiles for sewage and draining." Jan. 9, 1874.
138.—Jensen, P., Chancery Lane, London, "New or improved modes of and means and materials for the manufacture of gasholders and other vessels." A communication. Jan. 10, 1874.
403.—Lumley, T., Harborne, Staffs, "Improvements in steam-pumps." Jan. 31, 1874.
485.—Harrop, J. J., Manchester, "Improvements in the manufacture of tin-lined lead piping, and of tin and lead piping." Feb. 6, 1874.
848.—Goodall, R., Armley, near Leeds, "Improvements in the means or method of purifying foul water or sewage, and in the apparatus employed in connexion therewith." March 7, 1874.
1279.—Porri, J., and Leigh, E., Blackrod, near Chorley, Lancs, "Improvements in apparatus used in the manufacture of gas." April 14, 1874.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

3781.—White, W., Hampstead, Middlesex, "Improvements in the precipitation of sewage and other foul waters, and in the preparation of precipitating materials." Nov. 20, 1873.
3843.—Wirth, F., Frankfort-on-the-Main, "A new method of introducing burning gas into melting furnaces, and the apparatus employed therefor." A communication. Nov. 25, 1873.
3868.—Parker, J. F., and Wade, A., Birmingham, "Improvements in the process of and apparatus for the manufacture of coke and illuminating gas." Nov. 26, 1873.
3902.—Morton, R., Stockton-on-Tees, "Improvements in refrigerators or apparatus for cooling liquids, parts of which improvements are also applicable to distillation, surface condensation, heating or cooling fluids, air, or gases." Nov. 29, 1873.
3916.—Underhay, F. G., Clerkenwell, and Carter, A. E., Notting Hill, Middlesex, "Improvements in apparatus for preventing waste of water." Nov. 29, 1873.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

1210.—Duckham, H. A. F., "Improvements in apparatus for controlling or regulating the supply of gas to burners." May 4, 1871.
1227.—Newton, A. V., "Improvements in liquid-meters." A communication. May 6, 1871.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION has been AWARDED to

GWYNNE & BEALE'S PATENT IMPROVED GAS-EXHAUSTERS,

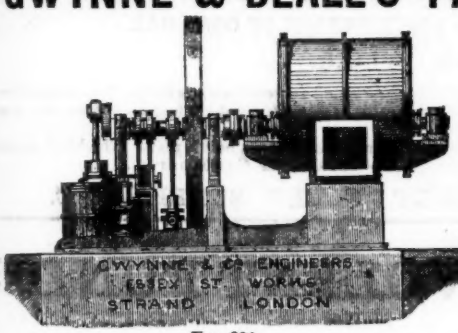


FIG. 224.

The BEST EXHAUSTERS IN THE WORLD.

Made under the personal superintendence of

Mr. BEALE,

The oldest Maker, Inventor and Patentee of GAS-EXHAUSTING MACHINERY.

(It is NOT CORRECT to state that Mr. BEALE has RETIRED.)

Prices and every information on application.

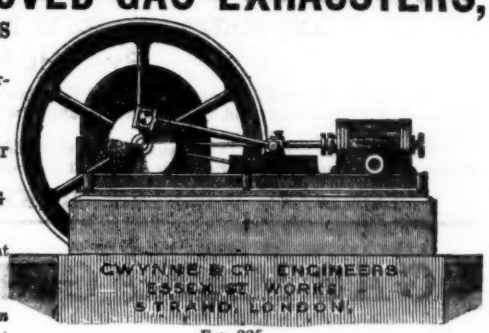


FIG. 225.

Fig. 224 represents one of those erected at the Imperial Gas-Works, Bromley, capable of passing 210,000 cubic feet of gas per hour. Several others of the same size are now on order for the same Company. These Patent Machines combine the highest quality of workmanship and materials, the largest bearings and wearing surfaces, with the **most perfect system of action yet discovered.** Fig. 225 represents one of a series of four at the Nottingham Gas-Works, each passing 52,500 cubic feet per hour. GWYNNE AND Co. *do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality, and the most approved design and arrangement.* Their prices have been estimated with a due regard to the **excellence of the article produced,** and when this is taken into consideration, they have no fear for the result. The orders executed this season for Exhausters and alterations to their patented system amount to over 4,000,000 cubic feet of gas passed per hour, and to over 300 horse power for Engines to drive them. In every instance their work is giving the greatest satisfaction. Numerous testimonials and references can be given.

REGULATORS, BYE-PASSES, STOP-VALVES, GAS-VALVES, & MACHINERY FOR GAS MANUFACTURE, OF ALL SIZES,
CAN BE HAD ON APPLICATION TO
GWYNNE & CO., HYDRAULIC & GAS ENGINEERS, ESSEX STREET WORKS, STRAND, LONDON, W.C.

G. & Co. are now manufacturing for a London Gas Company three of their 210,000 cubic feet Patent Gas Exhausters, and many of all sizes.

WANTED, Gasholder Makers.
Apply to W. C. Holmes and Co., Whitestone Iron-Works, Huddersfield.

WANTED, by the Advertiser, an engagement as RETORT-SETTER, either by piece or day work, or as GENERAL FOREMAN. Good references can be given as to abilities.
Address C. T. L., 22, Neville Street, Vauxhall, Surrey.

WANTED, an engagement as Manager or MANAGER and SECRETARY of a medium sized Gas-Work. Thoroughly understands the manufacture and distribution of gas, having had many years experience, and can give most excellent testimonials as to character and ability.
Address Manager, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

A GENTLEMAN desires to invest a sum not exceeding £10,000 in the purchase of a Gas-Work.
Address E. D., care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, a second-hand cast-iron TANK or PURIFIER, to hold about 500 gallons. Size preferred 8 ft. by 4 ft. by 3 ft.
Apply, with dimensions and price, to Thos. H. Methven, Bury St. Edmund's.

VINCENT'S
PATENT IMPROVEMENTS
IN
Apparatus for Manufacturing Gas.
Particulars to be obtained by application to—
Mr. LAYARD JONES,
Engineer,
25, OLD BROAD STREET, LONDON, E.C.

WANTED to purchase, 5000 to 10,000 tons of GAS COKE. Waggons can be sent to any station for any proportion of above.
Address G. J. Everson, Gas Coal and Coke Merchant, Stourbridge.

WANTED, a Gasometer, 9 ft. diameter, to rise 6 ft., and 10 ft. Tank in good condition. Also two PURIFIERS to suit.
Apply, with price and particulars, to H. Aland, 18, Richard Street, Roupell Street, Lambeth, London.

TO COAL PROPRIETORS.

THE Directors of the Londonderry Gas-light Company invite TENDERS for a supply of best GAS COAL, in quantities of not more than 3000 tons nor less than 1000 tons.
Sealed tenders, endorsed "Tender for Coal," specifying the description of coal proposed to be supplied, the pits from which they are to be raised, and the port of shipment, to be lodged with me not later than the 1st of June next.
The lowest or any tender not necessarily accepted.
By order,
John Macnie, Manager.
Gas-Works, Londonderry, May 21, 1874.

ROBUS, SIMPSON, & ROBUS,
(Late of the Crystal Palace District Gas-Works, Sydenham, and the New City Gas-Works, Montreal, Canada,)
GENERAL CONTRACTORS & RETORT-SETTERS, FITTERS & MAIN-LAYERS.
RETORTS SET ON THE LATEST IMPROVED PLAN.
Retort-Setters sent to all parts of Europe and America.
Address, J. and H. ROBUS,
BELL GREEN, CATFORD, KENT.

ADVANTAGES OF GAS FOR COOKING AND HEATING,
BY
MAGNUS OHREN, A.I.C.E., F.C.S.
For Companies to issue to their gas consumers.
Specimen Copy by post 4d., direct from Magnus Ohren, Gas-Works Lower Sydenham, London, S.E.

Just published, a pamphlet, price 2s.

METROPOLIS GAS SUPPLY: On the Chartered Gas Revision, 1874, by Arthur Silverthorne, C.E., a detail criticism of the late Award issued by the Board of Trade Commissioners respecting the Price of Gas supplied by the Chartered Gas Company in 1874.
London: Livermore and Robinson, 41, Bedford Street, Strand.

SUTTON, SOUTHCOATES, AND DRYPOOL GAS COMPANY, HULL.

FOR SALE, a set of four Dry Lime Puri-fiers, 10½ ft. diameter, 3½ ft. deep, 4 tiers of iron sieves, dry centre-valve, 9-in. connexions and lifting apparatus for covers.
The above are offered for sale on account of their being replaced by larger ones.
For price and particulars apply to F. W. Oldfield Manager.

TO COLLIERY PROPRIETORS AND OTHERS.

THE Oldham Corporation Gas and Water Works Committee are prepared to receive TENDERS for a supply of CANNEL and COAL.
Particulars may be obtained on application to Mr. Herbert Andrew, Gas and Water Offices, Oldham.
Tenders to be sent in to the undersigned on or before Tuesday, June 9, 1874.
By order,
H. Booth, Town-Clerk.
Oldham, May 21, 1874.

FOR immediate disposal, a well-known Gas Engineers and Gas Apparatus MANUFACTORY. Capitally situated in one of the principal towns in the Midland counties. The productions of this establishment are of high repute, and in considerable demand, having received numerous testimonials, prizes, and medals. The premises, machinery, appliances, and power are ample to a large extension of the business.

Full particulars and information will be supplied. Amount required £3000 to £4000.

Apply, by letter, to Mr. GEORGE SCAMELL, 40 and 41, Upper Thames Street, LONDON; or a note with appointment will oblige, to prevent disappointment.

GAS PLANT for SALE, as good as new. 2 Lengths of D Hydraulic, 18 in. by 18 in., 9 ft. 3 in. long.

2 lengths of 18 in. diameter Hydraulic, 8 ft. long.

2 lengths of 18 in. diameter Hydraulic, 9 ft. long.

42 sets of Flanched Bridge-Pipes, 4 in. diameter, with 3 ground stoppers in each.

A lot of 4-in. Ascension-Pipes.

28 15-in. Mouthpieces, with sockets on side.

35 15-in. Mouthpieces, with sockets on top, all having ears, lids, and cross-bars complete.

28 Sight-Hole Boxes.

14 Furnace-Doors and Frames.

All the above are nearly as good as new, and will be put upon the rails at Peterborough for £7 10s. per ton.

2 Iron Roofs. One 26 ft. span, the other 19 ft. span. Ten principals in each, with louvres, laths, &c., complete. £10 per ton.

2 10-inch Donkin valves, 90s. each.

4 Wrought-Iron Doors, 9 ft. high by 4 ft. wide. £10 per ton.

Apply to Mr. TRIMEN, Contractor, Gas-Works, PETERBOROUGH.

SLIDE-VALVES.

FOR SALE—14 12-in. and 5 10-in. Slide- VALVES with outside racks. They have been thoroughly re-fitted, and are equal to new. A low price will be accepted to effect a clearance.

Apply to JAMES WATSON, Engineer and Manager, Crystal Palace District Gas Company, LOWER SYDENHAM, S.E.

FOR SALE, and ready for immediate delivery by the Barnstaple Gas Company, about 35 ft. of 12-in. Hydraulic Main, in five lengths; 15 ft. of 16-in. Hydraulic Main; cast-iron Stools for ditto; 21 15-in. Mouthpieces; a number of Ascension-Pipes, Bridges, and Dips; together with a quantity of odd castings suitable for a small work.

Feb. 26, 1874.

TO GAS DIRECTORS IN THE EASTERN COUNTIES.

GAS-WORKS Leased at a rent which will produce from 8 to 10 per cent. dividend on the capital, unless where it is unusually large and the consumption of gas small in proportion.

Apply to EAST ANGLIA, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

HYDRAULIC MAIN AND RETORT FITTINGS FOR SALE.

THE Longton Gas Company have for SALE the Hydraulic Main, Ascension-Pipes, Front Plates, and all the necessary fittings of a Bench of Brick Retorts. The above will be sold at a cheap price.

For further particulars apply to Mr. J. M. DARWIN, Gas-Works, Longton, STAFFORDSHIRE.

THE THAMES BANK IRON COMPANY,

(Successors to LYNCH WHITE,)

SUPPLY FROM STOCK

CAST-IRON RETORTS, SOCKET-PIPES for GAS or WATER PURPOSES, FLANGE-PIPES for STEAM, RAIN-WATER PIPES and GUTTERS, HOT-WATER PIPES and BOILERS, and all requisite Connexions for same; also LAMP-COLUMNS, LAMPS, WROUGHT FRAMES, WROUGHT-IRON TUBING, &c., &c.

All kinds of Gas-Works Apparatus and General Castings made to Pattern or Drawing.

ADDRESS—

OLD BARGE WHARF, UPPER GROUND STREET, LONDON, S.E.

NOW READY, PRICE 7s., BY POST, 7s. 3d.,

THE SECOND EDITION

OF THE

GAS MANAGER'S HANDBOOK;

CONSISTING OF

TABLES, RULES, AND USEFUL INFORMATION FOR GAS ENGINEERS, MANAGERS, AND OTHERS ENGAGED IN THE MANUFACTURE AND DISTRIBUTION OF COAL GAS.

By THOMAS NEWBIGGING, A.I.C.E.

"This edition of a well-known and esteemed Handbook is a considerable improvement, both in form and contents, on the first. The information, which is of the most wide and various kind, is taken from authoritative sources, and altogether this may be fairly described as among the most useful manuals of its class."—*Iron.*

"A new edition has just been issued. Valuable additions have been made, and the contents are arranged on a better plan. The book is now published in a small octavo form, which makes it a handy book, either for the pocket or the desk."—JOURNAL OF GAS LIGHTING.

LONDON: WILLIAM B. KING, 11, BOLT COURT, FLEET STREET, E.C.

THE

"GAS MANAGERS BENEVOLENT FUND,"

INSTITUTED BY THE

WEST OF SCOTLAND ASSOCIATION OF GAS MANAGERS.

OBJECT.

The object of the Benevolent Fund shall be to afford assistance to necessitous Managers (**in any Country**) and their Families, and to the Widows and Families of deceased Managers, whose death may be caused by accident in discharge of duty, or from natural causes, and for relief in other cases requiring attention.

CIRCULAR.

To Gas Managers, Gas Engineers, Gas Companies, Directors, Manufacturers, and Colliery Proprietors.

GENTLEMEN, *April* 30, 1874.

At the last GENERAL MEETING of the "West of Scotland Association of Gas Managers," held on the 26th of March last, it was unanimously resolved to issue circulars, and make an appeal to all parties interested in Gas-Works, so as to raise, by one effort, such a Fund as will give an annual income sufficient to meet demands on the Fund from any country.

During the past year the Society have been enabled to give considerable relief, and have received ample proof of the utility of such a Fund; and it is now agreed to make one united and earnest appeal, in the hope that in every case it will be responded to, and the sum most respectfully asked of you—not as an annual subscription, but merely as a present donation in the sum of TWENTY SHILLINGS—be cheerfully given.

NO SECOND APPEAL shall be made to any donor of the sum of 20s., and each donor shall receive annually from the Association (free of expense) a copy of Annual Statistical Report on the Gas Supply of Scotland, which contains list of towns, population, name of manager, gas made, per centage of leakage, illuminating power, price per 1000 feet, &c., &c.

The Committee of Management beg respectfully to lay before you this petition, humbly praying you to earnestly consider it, and by your aiding the object and formation of a large General Fund, so honourably undertaken by this Association to meet the requirements of worthy or aged and necessitous members of the profession, they feel you will have conferred a boon; and you will have the heartfelt thanks of gas managers in general.

It is intended that lists of donations shall for some time be published in the JOURNAL OF GAS LIGHTING, weekly, and it is hoped intending donors will forward their donations within one month from date of this circular.

Mr. WILLIAM SMITH, Gas-Works, Helensburgh, has accepted the interim Treasurership of this Fund, and Post-Office Orders are to be made payable to him; and, for the week ending the 20th inst., has to acknowledge the following donations:—

Dunn Brothers, 22, Great Clyde Street, Glasgow.	£3	3	0
George Niven, Manager for Airdrie Gas Company	1	0	0
John Renie, Secretary to Gas Company, Strathaven.	1	0	0
A Friend, Falkirk	1	0	0
Charles Horsley, 22, Wharf Road, London	1	0	0
Robert Reddie, Manager, Gas-Works, Leven	1	0	0
Robert Reid, Secretary, Gaslight Company, Beith	1	0	0
William Thomson, Chairman, Boness Gas Co., Boness	1	0	0
William Carey, Manager, Wemyss Colliery	1	0	0
R. H. Jones, J.P., Engineer, Gas-Works, Dover	1	0	0
William Sugg, Gas Engineer, Westminster	1	0	0
Henry T. Balfour, 39, Finsbury Circus, London	1	0	0
W. C. Parkinson, Cottage Lane, City Road, London	1	0	0
Tangye Brothers and Holman, Laurence Pountney Lane, London	1	0	0
Yarmouth Gas Company, per Secretary	1	0	0
Herbert Unwin, Engineer, Gas Office, Sheffield	1	0	0
M. Lucas Roberts, Manager, Gas Office, Sheffield	1	0	0
Levi Monk, Manager, Lanark	1	0	0

"*From B. M. M'Crae, Esq., Gas Engineer, Dundee, to Mr. William Key.*

"*May* 15, 1874.

"Dear Sir,—I had the pleasure of handing the £5, for which the enclosed is the receipt.

"Had you and the members of the West of Scotland Association witnessed the gratitude of the widow of a deceased manager, it would have done your hearts good. I felt that should the Association never do more than that one act, it had done good. Mrs. —— is said to be a very industrious woman, has three children, keeps her mother, who is in bad health, yet notwithstanding these adverse circumstances, her dwelling, though humble, is clean, and bears a comfortable aspect.

"I mention these facts to encourage you and your members to persevere in your good work—it is a good work. When the breadwinner is by providence removed by death, what a comfort it is to know that a sum, though it may be small, will annually be forthcoming from such a source.

"May your membership increase, your benevolent fund expand, and may the cases such as I have described be few, is the wish of

"Yours faithfully, "B. M. M'CRAE."

JAMES BLACK, Secretary, Gas-Works, Old Kilpatrick.

BRITISH ASSOCIATION OF GAS MANAGERS.

ANNUAL MEETING OF MEMBERS.

CIRCULAR OF ARRANGEMENTS.

THE

ELEVENTH ANNUAL GENERAL MEETING

OF THE MEMBERS OF THIS ASSOCIATION WILL BE HELD ON

TUESDAY, WEDNESDAY, & THURSDAY, the 9th, 10th, & 11th of June, 1874,

AT

THE SOCIETY OF ARTS ROOMS,

JOHN STREET, ADELPHI, LONDON.

GEORGE T. LIVESEY, ESQ., MEMB. INST. C.E., PRESIDENT,

Will occupy the Chair.

ORDER OF PROCEEDINGS.

TUESDAY, JUNE 9, 1874.—Morning Meeting.

The Chair to be taken at Eleven o'clock.

Inaugural Address by the President. | Admission of New Members.
Reading of Papers and Communications.

Evening Meeting.

A Lecture will be delivered at the Society of Arts Rooms, by ROBERT ETHERIDGE, Esq., F.G.S., &c., &c., "On the Geology of Coal." The chair will be taken at Half-past Seven o'clock.

WEDNESDAY, JUNE 10, 1874.

The Chair to be taken at Eleven a.m.

Reading of Papers and Communications, and the Transaction of other Business.
Election of Officers for ensuing Year, &c.

At Six p.m. the Members and Friends will dine together at the Terminus Hotel, Cannon Street.
Tickets for the Dinner, 7s. 6d. each, may be had from the Secretary.

THURSDAY, JUNE 11, 1874.

An Excursion by Steamboat to Woolwich to inspect the Royal Arsenal, for which special arrangements have been made with the sanction of the War Department.

LIST OF PAPERS AND COMMUNICATIONS

TO BE SUBMITTED TO THE MEETING.

"Vincent's Patent Gratings applied to Gas-Retorts." By Mr. HODGSON JONES, of London.
"Purification." By Mr. GEORGE ANDERSON, of London.
"Condensation and its Effects in the Retention of Naphthaline." By Mr. JAMES WATSON, of the Crystal Palace District Gas-Works, London.
"Desirability of Companies extending their Control to the Point of Consumption." By Mr. ISAAC A. CROOKENDEN, London.
"Meters." By Mr. W. J. WARNER, of South Shields.
"Improved Method and Apparatus for Manufacturing Gas." By Mr. JOHN WEST, of Maidstone.
"Retention of Naphthaline." By Mr. G. D. MALAM, of Halifax.
"Gasholders." By Mr. C. WOODALL, of London.
"Unique Effects from Simple Means; or, a Description of the latest results obtained by Mr. Abraham Malam from his New Process for Manufacturing Cannel Gas, with Models, &c." By Mr. G. D. MALAM, of Halifax.
"Gasholder Tanks in Concrete," by Mr. J. DOUGLAS, of Portsea.

May 23, 1874. WILLIAM H. BENNETT, *Secretary.*

F. & C. OSLER,

45, OXFORD STREET, LONDON, W.

MANUFACTORY AND SHOW-ROOMS:

BROAD STREET, BIRMINGHAM.

ESTABLISHED 1807.

MANUFACTURERS OF CRYSTAL GLASS CHANDELIERS

WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES.

TABLE GLASS OF ALL KINDS.

CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS.

TO GAS COMPANIES, ENGINEERS, CONTRACTORS, AND OTHERS.

GEORGE NEWTON,

UNION STREET WEST, OLDHAM,

BRASS FOUNDER AND FINISHER,

MANUFACTURER OF

IMPROVED WET AND DRY CONSUMERS GAS-METERS,

LAMP METERS AND BOXES,

GOVERNORS, GAUGES, INDICATORS, EXHAUST & PRESSURE REGISTERS,

GAS STATION-METERS,

With all the joints planed.

TERMS, &c., ON APPLICATION.

RIPON CITY GAS-WORKS.

MANAGER WANTED.

THE Local Board for this city wish to engage a thoroughly competent and experienced MANAGER for their Gas-Works, at a salary of £100 per annum, with a good house and garden rent free, and coals, gas, and water, and the parochial and Local Board's rates will be provided or paid for him.

Applications in the candidate's own writing, marked on the outside "Gas-Works Manager," and stating age and previous employment, with testimonials as to character and fitness for the appointment, are to be sent in on or before Saturday, the 30th day of May instant, to me, at my Offices in Ripon, where also any further information required may be obtained.

R. W. NICHOLSON,
Town-Clerk, and Clerk to the Local Board.
Ripon, May 13, 1874.

BOLTON CORPORATION—GAS DEPARTMENT.

CONTRACTS FOR CANNEL AND COAL.

THE Gas Committee are desirous of receiving TENDERS for CANNEL and best GAS COAL or NUTS, in quantities of not more than 10,000 tons or less than 3000, for the year commencing the 1st of July next, to be delivered free at the Bullfield or Craddock Lane sidings of the Lancashire and Yorkshire Railway, at Bolton, or, if carted, at the Gas Street or Lum Street works, as may be required.

Sealed tenders, endorsed "Tender for Coal," specifying the description of Cannel or Coal, the pits at which they are to be raised, and the quantities proposed to be supplied, to be sent to the Chairman of the Committee, Thos. W. Holden, Esq., on or before Tuesday, the 2nd of June next, stating also cash terms for monthly payments.

The Committee do not bind themselves to accept the lowest or any tender, but the person or persons whose tender may be accepted, will be required to execute an agreement for the due performance thereof.

By order,
R. G. HINNELL, Town-Clerk.
Gas Offices, Bolton, May 7, 1874.

DARLINGTON CORPORATION—GAS DEPARTMENT.

TO BUILDERS, CONTRACTORS, AND ENGINEERS.

THE Darlington Corporation invite TENDERS for the following EXTENSIONS of their works, each contract to be tendered for separately;—

CONTRACT No. 1.—For the Excavation, Puddling, Brickwork, &c., required to be done in the construction of a Gasholder Tank, 102 feet diameter, and 25 feet deep.

CONTRACT No. 2.—For the various works required to be done in the erection of a Retort-House, capable of containing 120 Retorts.

CONTRACT No. 3.—For the construction and erection of Wrought-Iron Roof for the previously named Retort-House.

Drawings, specifications, and conditions of Contract may be seen on and after the 18th inst., on application to Mr. WM. B. EMMERSON, Engineer and Manager, Gas-Works, Darlington, to whom all tenders must be sent, properly endorsed, not later than the 22nd of June next.

The Corporation do not bind themselves to accept the lowest or any tender.

By order,
H. DUNN, Town-Clerk.

Mr. ALFRED LASS,

60, CORNHILL, LONDON, E.C.,

Is prepared to open the Books, and, if necessary, keep the Accounts of Gas and Water Companies.

To examine the Books and Accounts, and prepare Balance-Sheets for the information of Directors.

To assist Secretaries in preparing Balance-Sheets, according to the "Gas-Works Clauses Act, 1871;" or may be consulted with respect to Accounts generally.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 42, Parliament Street, WESTMINSTER.

MR. NORWOOD EARLE, late of the Dover Gas-Works, is prepared, after 17 years experience, to undertake the duties of SURVEYOR to Gas Companies and Corporations in all matters relating to the Distribution of Gas and Gas Testing. Contracts entered into for the Survey of Mains, Services, Public Lamps, &c., in order to reduce the per centage of unaccounted-for gas to the lowest possible amount.

Valuations for Assessment, Transfer, and other purposes.

Arrangements made with Companies desiring the occasional use of an Office in the City.

12, QUEEN VICTORIA STREET, LONDON, E.C.

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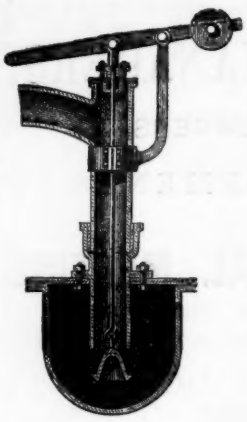

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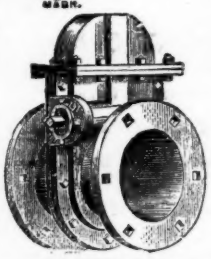
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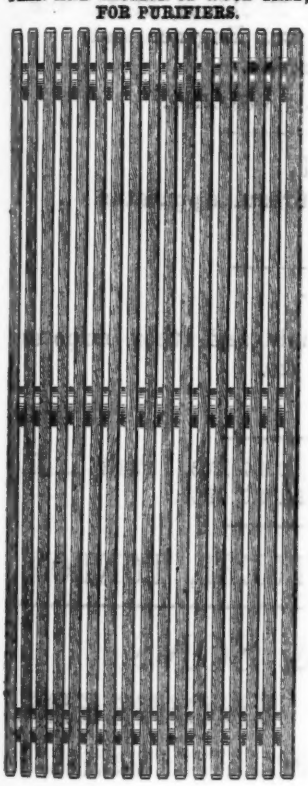

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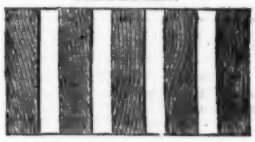

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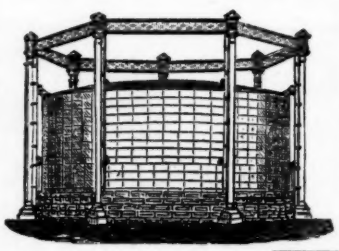

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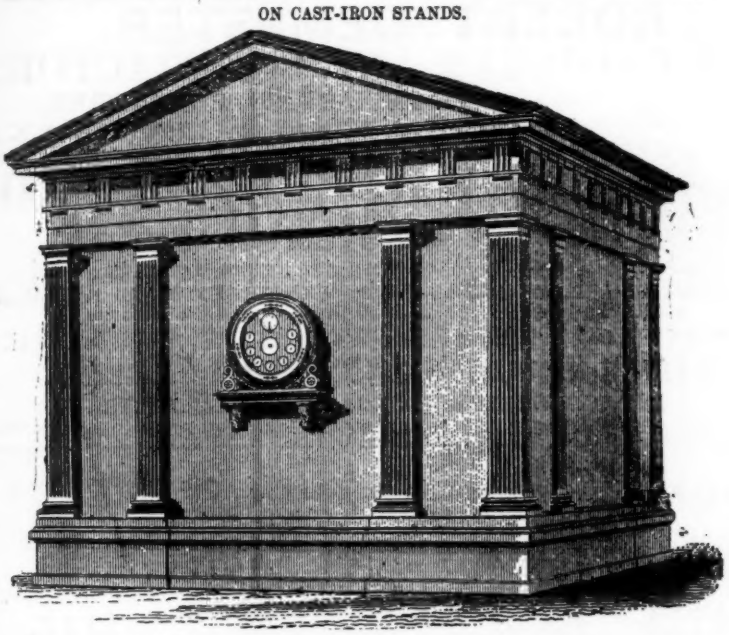

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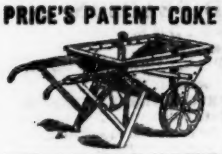

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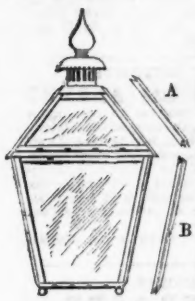

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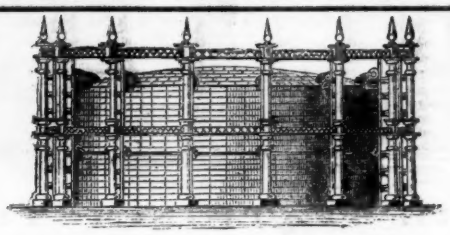

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CELEBRATED SILKSTONE GAS NUTS.
Analysis by F. J. EVANS, Esq., Chartered Gas Company, Horseferry Road, Westminster:—
(COPY.)

	Cubic Feet of Gas per Ton of Coal.	Illuminating Power in Candles.	Coke per Ton of Coal used.	Ash in Coke, per Cent.	Sulphur in Coal, per Cent.
Silkstone Nuts . . .	10·800	15·85	12·66 cwt.....	6·0	0·69

NOTE.—The illuminating power of the gas was tested by the standard burner now used in London by the Gas Referees, under the City of London Gas Act, 1868.
Horseferry Road, Westminster, March, 1870. (Signed) F. J. EVANS.
These Nuts are extensively used by various Gas Companies throughout the Kingdom, who bear strong testimony to their value.
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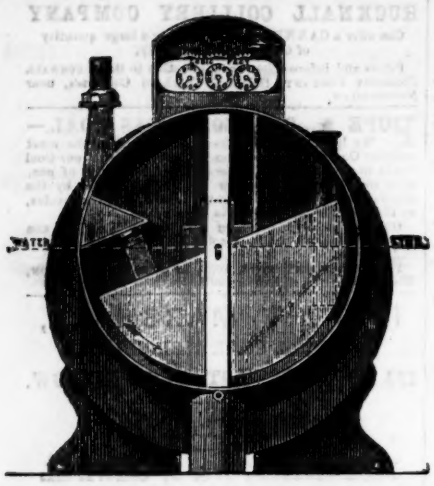

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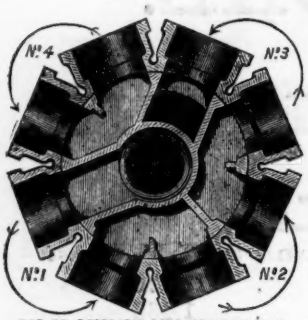

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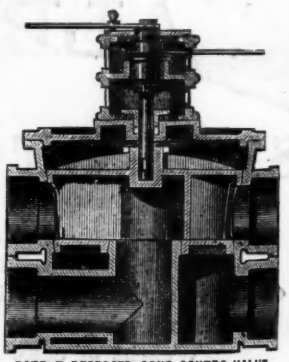

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